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HANDBOOK ON PLANNING SCHOOL FACILITIES.

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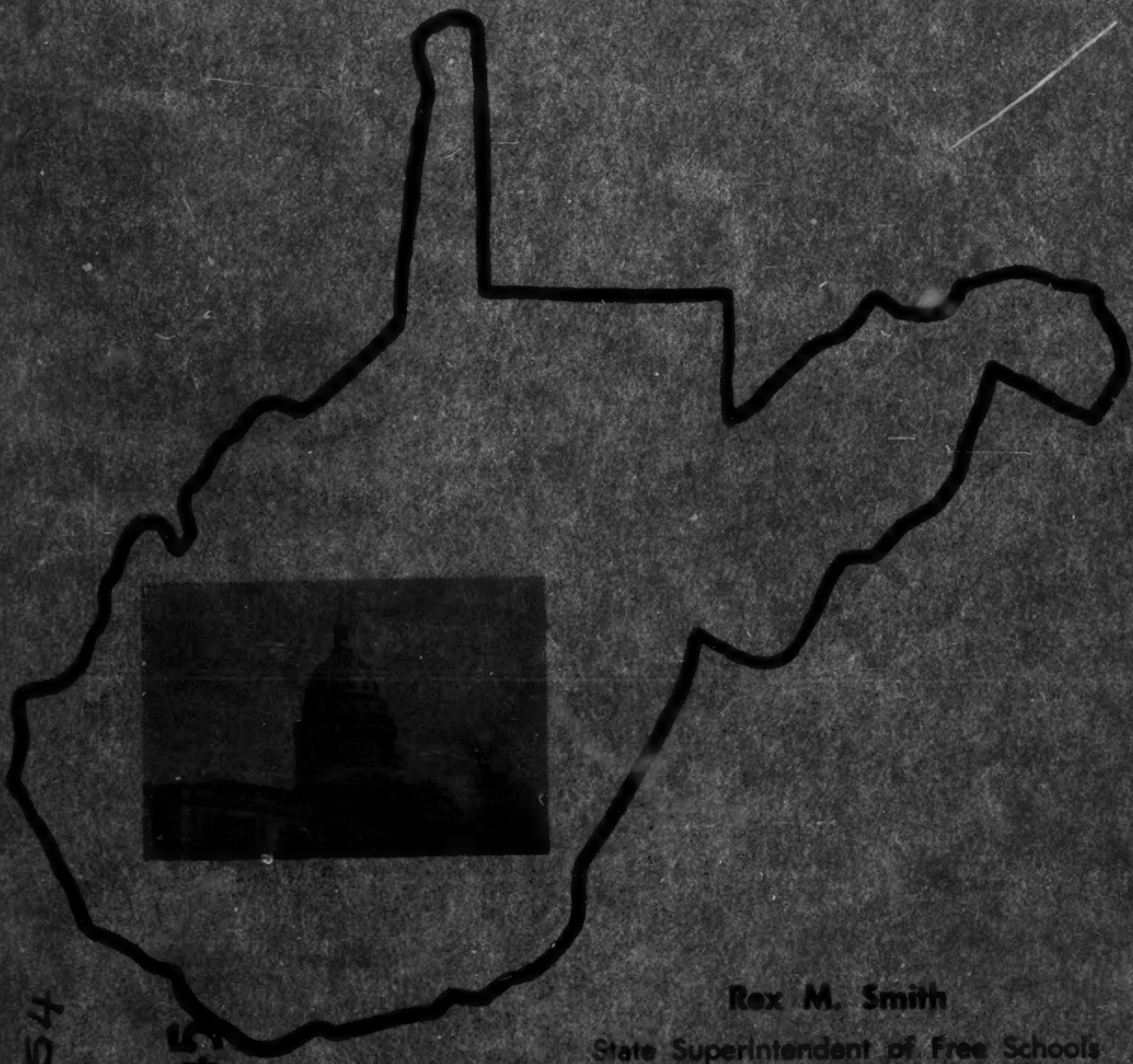
Prepared for the purpose of supplementing "Guide for Planning School Plants" published by the National Council on Schoolhouse Construction. In outline form it contains chapters concerning--(1) The School Plant Program, (2) School Site, (3) The Elementary School, (4) The Secondary School, (5) School Plant Safety, (6) Service Facilities, (7) Common Environmental Factors, and (8) Related Information. The beginning of each chapter contains appropriate page references to the Guide, followed by the related supplementary material. Also included are references to pertinent sections of the West Virginia State Code related to school construction, suggestions for architectural contract provisions, project approval forms, and a checklist of school board and school administrator task responsibility areas related to school construction. (NI)

HANDBOOK ON PLANNING SCHOOL FACILITIES



Rex M. Smith

State Superintendent of Free Schools

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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HANDBOOK ON PLANNING SCHOOL FACILITIES

Division of School Plant Planning
West Virginia Department of Education
Charleston, West Virginia

Supplementing: **Guide for Planning School Plants**
National Council on Schoolhouse Construction
406 Education Building
Michigan State University
East Lansing, Michigan

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FOREWORD

In this day of rapid change in science, technology, and the accumulation of knowledge in general, we face the ever-mounting task of maintaining and setting the pace in education. In recent years, we have witnessed and experienced experimentation and change in educational processes and practices. Included among these are inovations in programmed instructions, various grouping techniques for instructional purposes, team teaching, the use of electronic media and other approaches to the problem of keeping up with today's world. In face of change, we shall, and must in certain instances, continue to use conventional means, with modifications, to improve performance in classrooms. Besides pupils, teachers, and administrators—school buildings are affected by changes in educational programs and methods of instruction. School buildings in the future must be planned and constructed to permit adaptions in programs which are housed therein. The publication before you attempts to break from the rigidity of "school building standards" of the past and offers direction and guidance in an open-ended fashion. Prepared in this manner, it is hoped that the material contained in this publication will not bind school planners to the "accepted" method of planning and constructing classrooms, special facilities, and schools in general. Although some recommendations may not be attainable immediately and others may soon become obsolete, it is expected that this booklet will be a valuable tool for members of boards of education, school administrators, architects, engineers, and others concerned with planning and building better school plants in the state.

REX M. SMITH
State Superintendent of Free Schools

PREFACE

School construction has been guided for a little more than a decade by a document created in 1945, revised in 1951, and slightly modified in 1957. This well-written publication, *Standards for Schoolhouse Construction*, expressed in detail minimum standards considered essential to obtaining satisfactory school facilities in the State. It was recognized during the late 1950's that many of the items included in the document were incompatible with improved construction techniques and materials, and current concepts regarding educational facilities. Thus in August, 1960, the State Board of Education tentatively adopted the *Guide for Planning School Plants,* published by the National Council on Schoolhouse Construction, as a standard for school construction in West Virginia. The adoption was made for the period necessary to revise existing criteria or adopt other criteria to guide schoolhouse construction. A committee representing education, architecture, and other interests began work on the problem early in 1961. The committee agreed that a publication on this subject should: (1) embody school building practices generally accepted as desirable, adapted where necessary to West Virginia's education and fiscal organization and to the State's geography and topography; (2) emphasize educational planning; (3) present usable material without technical terminology; and (4) offer a maximum of helpful guidance and minimum of control.

In compliance with these objectives, the committee recommended the official adoption of the *Guide* as the basic document concerning school plant planning for use in West Virginia. In recommending this adoption, the committee thought it also necessary to prepare the *Handbook on Planning School Facilities* emphasizing, amplifying, and modifying the contents of the *Guide*. The make-up of the *Handbook* follows the content sequence of the *Guide*. Chapters 3 and 4 of the *Handbook* have, however, been prepared in the form of outline educational specifications to facilitate rapid reference. The general procedure followed was to review each chapter of the *Guide,* identifying pertinent or key ideas, and supplementing these statements with criteria appropriate to West Virginia. During the past year, *Guide* materials and the committee modifications have been submitted to various individuals and groups in the Department of Education, in local school districts, and in other state agencies whose work affects the field of school construction. The committee is indebted to these individuals and agencies for their assistance in the form of suggestions and criticisms.

It should be noted that inasmuch as the *Guide* will be revised from time to time, the *Handbook* is prepared in a manner in which revision in whole or in part may be accomplished with the minimum of effort. The development and use of new materials and construction techniques, the changing of education programs, and changing requirements for facilities to accommodate these programs, prompt the publication of the *Handbook* in this form. It is anticipated that it will serve as a ready reference on school plant planning problems and also as a stimulus to further exploration of the *Guide* and other references pertained to planning school facilities.

Committee on West Virginia School Plant Standards

Albert Anson, Jr.
Jack G. Capehart
W. R. Cooke
Henry T. Elden
C. N. Fannin
William H. Grant
Glen C. Hancock
G. Cameron Hunter
William J. Kreps
E. S. Shannon
Walter F. Snyder
Joseph S. Soto
Stark Wilmoth
Robert C. Welsh

William L. Stormer, *Chairman*

NOTE

For the convenience of school personnel and others frequently using this publication in conjunction with the *Guide for Planning School Plants,* the *Handbook* has been:

1. Printed the same size as the *Guide.*
2. Printed on colored paper, and
3. Bound in loose-leaf fashion.

Prepared in this manner, the *Handbook* may be inserted in the *Guide's* plastic binder for ready reference.

Chapter I

THE SCHOOL PLANT PROGRAM

A board of education in West Virginia has the responsibility to supply and maintain a "sufficient number of suitable schoolhouses and other buildings to meet the educational needs of its district." Professional educators, employed by the board of education, assist in the planning, organizing, and administering programs aimed at the fulfilling of this and other obligations. Residents of the school district and the State, as a whole, look to the board of education for the performance of these services.

Through the initiative and leadership of administrative staff, the board of education seeks to identify the school building needs of the district and determine ways and means of providing required facilities. In this effort, assistance and cooperation may be obtained from local lay and professional organizations, college and university personnel, the Division of School Plant Planning, and architectural and engineering firms. In the final analysis, it remains the responsibility of the board to adopt a program designed to meet these needs in a satisfactory manner. Lay groups, educational specialists, legal advisors, school personnel, and architects can render invaluable aid in carrying the program to completion under the direction of the board and its administrative officers. Major steps in this process include:

100 *References: Handbook*—Section 402, Chapter 8; and *Guide*—pp. 1-16; 75-94.

101 *Analyzing Educational Needs:*

101.01 Basic to the entire process of planning school plants is determining the character of the school program which is to be housed.

101.02 Decisions regarding the total program and services to be provided by the schools or accommodated in the school plants, and the age groups for which each service will be made available include:

a. The type of school organization.
b. The optimum size of schools.
c. The desired pupil-teacher ratio.
d. Curriculum content.
e. Teaching methods and materials to be used.
f. Internal organization for instruction.
g. Health services to be rendered.
h. Nature of library and food services.
i. Extent of social, athletic, and recreation programs.

102 *Surveying The School Plant:*

102.01 The improvement of educational programs is a result of continuous planning. When school construction is contemplated, school personnel have the opportunity to evaluate and reaffirm or reject aspects of educational programs and services.

102.02 In surveying school plant needs, the opportunity is present to answer:

a. What are the school plant needs as indicated by the analysis of the existing school program and modifications of the program which would be made if more adequate facilities were available?
b. What are the school plant needs as indicated by an anlysis of enrollment trends and projected future enrollment?
c. To what extent and in what manner can the existing school school plant satisfy the above needs?
d. To what extent can transportation patterns be modified to meet educational needs?
e. What are the financial resources available to the board of education for undertaking a program of the school plant improvement?
f. In light of the answers to these questions, what remodeling and/or new construction should be undertaken?

103 *Selecting and Acquiring the Site:*

103.01 Criteria for selection and acquisition of sites should be officially adopted by the board of education; this action provides a good defense against those who attempt to urge upon the school board some inappropriate piece of land.

103.02 Refer to criteria suggested in Chapter 2 of the *Handbook* and in the *Guide*—pp. 17-35.

103.03 Sites are generally acquired by the following methods:

a. The board negotiates for the property.
b. The board acquires the property by condemnation.

104 *Developing Educational Specifications:*

104.01 Each construction project requires detailed planning: one aspect is the development of educational specifications, which provides the basis for architectural planning.

104.02 Educational specifications should be in written form and should include a description of the program and its underlying philosophy; a list of the facilities needed, including equipment; statements which with respect to any special needs as to the location of different types of facilities, and descriptions of any special features required in each.

104.03 Educational specifications prepared for each project serve:

a. As a concise and comprehensive guide to the architect in developing sketches, preliminary plans, detailed layouts, working drawings, and architectural specifications for the project.

b. As a stimulus to cooperative curriculum improvement involving both educators and lay citizens, with specifications being a summarization of such work.

c. To define the existing educational program, point out the desired future programs, and recommend first steps in reaching these long-term goals.

d. As a guide for the board of education and the school staff in the evaluation of the architect's tentative solutions to specific educational problems.

104.04 Refer to the *Guide*, pages 8-9; 82-84, for specific characteristics of educational specifications and to the *Handbook*, Chapter 3 and 4. The latter contains educational specifications in outline form.

105 *Architectural Planning and Designing:*

105.01 The architect's planning is generally done in two phases: (1) designing the project, and (2) preparing working drawings and specifications and other contract documents.

105.02 The design phase is essentially the critical one; for at this time the arrangement of the building and site, the general methods and materials of construction, and the general character and appearance of the completed project are fixed.

105.03 In the design phase the architect's decisions are influenced by his knowledge and understanding concerning:

a. The fixed requirements or strong convictions of the board.

b. Architecture and construction.

c. Potentialities and limitations of the site.

d. The financial limitations pertaining to the project.

e. The educational specifications.

105.04 If preliminary planning is thorough and the superintendent's and board's consideration of preliminary plan is adequate, there is little likelihood that the board will ask for major modifications of the working drawings and specifications when the architect submits them for approval.

105.05 Thorough review of preliminary and final plans and specifications of the project by the school staff, the board, and approving agencies is critical to the acquisition of adequate school plant.

106 *Bidding, Writing Contracts, and Erecting the Building:*

106.01 Upon the approval of working drawings and specifications by the board of education and state agencies, bids may be secured.

106.02 The board will advertise for bids to be submitted on or before a specified time and at specific location. Each bid will be accompanied by a certified check or a bank draft in the amount of 5 per cent or a bidder's security bond in the amount of 10 per cent of the total bid.

106.03 The advertisement should state that the board reserves the right to accept or reject any or all bids and to readvertise the project if necessary.

106.04 Generally, the architect takes the responsibility for preparing the advertisements, bid forms, bid bond forms, performance and payment bonds, and forms of agreement between the board of education and the successful bidder(s).

106.05 Upon receipt of bids, they will be opened publicly and entered upon the minutes of the board of education. The architect will assist the board of education and school personnel in analyzing the bids.

106.06 The architect's advice on awarding the contract is of particular value with respect to legal aspects of contract provisions which regulate alterations, extras, nonperformance, damages, and security bonds.

106.07 Under usual arrangements, the architect has the following responsibilities during construction:

a. Notifying the board and the contractors of certain duties such as purchasing insurance, applying for permanent utility service, etc.

b. Preparing such additional detailed drawing as contractors may require during the progress of their work.

c. Checking shop drawings prepared by fabricators of steel, cabinet work, and other items to be used in the building to see that they conform to requirements.

d. Keeping records of quantities and values of materials delivered to the site and of work completed, and on the basis thereof approving the contractors' monthly applications for payment on account.

e. Providing general supervision to guard the board of education against defect and deficiencies in work of the contractors.

f. Preparing change orders covering deviations from the approved drawings and specifications for approval of the board of education and other agencies when required.

106.08 The architect cannot give continuous supervision, but he shall be expected to maintain such personal contact with the project as is necessary to assure himself of full compliance with the approved plans and specifications.

106.09 On large projects, it may be advisable for the board to employ a competent clerk-of-the-works for continuous general supervision of the work of the contractors and administering the necessary business affairs incidental to construction.

106.10 In order for work to progress favorably, contractors should have only one person from whom they receive orders, normally this is the architect.

106.11 Upon completion of the construction, the board or its representatives and the architect shall make a final inspection of the work before the board accepts the finished product for occupancy and again before the termination of the performance bond.

107 *Equipping the Building and Putting It Into Use:*

107.01 All equipment and furniture to be placed in the school should be known as to the size, type, make, and arrangement prior to the completion of final plans and specifications so that unnecessary delays will not be encountered. Such delays may be the result of roughing-in utilities for equipment of one design and the purchase being equipment of another design.

107.02 Teachers and other employees must be instructed concerning the building and its potentialities if they have not already acquired this knowledge to a sufficient degree through the participation of the planning process.

108 *Plant Program Controls:*

108.01 The board of education maintains complete control of the entire program through exercising its right to approve or disapprove at every critical point, and by deciding when to authorize superintendent or architect to proceed with next steps:

a. Authorizing the study of the school program and adopting educational policies resulting therefrom.

b. Authorizing the survey and adopting a building program on the basis of the results thereof.

c. Establishing site criteria, inaugurating steps to select and purchase sites, and authorizing the purchase of sites approved by it.

d. Authorizing the preparation of educational specifications for each building and passing on the completed document.

e. Selecting the architect, educational consultant, legal advisor, and other specialists.

f. Authorizing the preparation of architectural drawings and specifications, approving them upon completion of preliminary plans, approving the working drawings and specifications and any subsequent change in the same.

g. Deciding when to proceed with construction, awarding contracts, inspecting and accepting the completed building.

h. Authorizing the expenditure of necessary funds at each stage of the program.

Chapter 2

SCHOOL SITE

200 *References:*

Handbook—Sections 505, 601, 608, Subsection 703.022; and the *Guide*—pp. 17-35; 167.

201 *Selection:*

201.01 Site selection is a technical problem involving the cooperative efforts of school officials, the architect, recreational consultants, urban planners, and legal consultants.

201.02 Sites should be selected, if possible, well in advance of actual needs.

201.03 Tools to be consulted when selecting sites include: land-use map, aerial photograph, soils map, topography map, highway map, neighborhood or school-service area map, preschool and pupil-spot maps, dwelling unit map, and total and school population projections.

202 *Location:*

202.01 School sites should be located and delevoped in proper relationship with existing and proposed physical facilities in the communities including: parks, recreation centers, libraries, health centers, streets, highways, and residential housing.

202.02 Schools should be located near the center of the present or probable future school population to be served, if adequate sites are available.

202.03 The following distances are considered the *reasonable maximums* for pupils transported to school. The distances are stated in one-way travel time.

a. One-half hour for elementary school pupils.
b. One hour for secondary school pupils.

202.04 The following distances are considered *reasonable maximums* for pupils walking to school.

a. Elementary school pupils—three-quarters of a mile.
b. Junior high school pupils—one and one-half miles.
c. Senior high school pupils—two miles.

NOTE: The Code of West Virginia (Chapter 18, Article 8, Section 1, Exemption D) states that a school board cannot compel a pupil to attend a school if he lives more than two miles from the school or a means of free transportation. It is emphasized that these figures are stated as reasonable maximums and should be weighed in terms of other factors, such as sparsity of population and topography.

202.05 Sites should be selected where a growth or spread of population is anticipated so as to avoid undue overlapping of areas to be served by different schools.

202.06 The environment of every school should provide to the greatest possible degree:

a. Safe and healthful conditions for pupils and teachers.

b. Freedom from disturbing noises.

c. Freedom from obnoxious odors.

d. Surroundings that tend to create a feeling of pride and happiness.

202.07 Public-service facilities which should be available for a school site include: water, gas, telephone, electricity, sewage disposal, fire protection and transportation.

203 *Size:*

203.01 Experiences indicated that the ultimate site requirements should be met with the initial site acquisition because land, adjacent to a new school, soon becomes occupied with housing developments or commercial establishments.

203.02 The size of any school site should be determined largely by the nature and scope of the contemplated educational program.

a. Factors creating the need for larger sites include: outdoor education supplementing regular classroom instruction, provision of facilities for games and recreation for groups of various ages including adults, preservation of natural sites such as a grove for community picnics, and the relationship of a school site to over-all community planning and to other available public-used areas.

203.03 The recommended minimum site sizes for West Virginia vary from those which have been recommended in the *Guide* due to the sparsity of population and the topography in some areas of the State. Because the site size varies in accordance with the needs of the type of school organization and in terms of the age and development status of the community, the following rules must be taken as minimums for which all should strive and which most should exceed.

a. The acceptable minimum size for an elementary school building housing less than 120 pupils is three acres, plus one additional acre for each 100 pupils enrolled.

b. The acceptable minimum site size for an elementary school building containing 180 pupils or more is five acres, plus one additional acre for each 100 pupils enrolled.

c. The acceptable minimum site size for a junior high school is 10 acres, plus one additional acre for each 50 pupils enrolled.

d. The acceptable minimum site size for a senior high school is 15 acres, plus one additional acre for each 50 pupils enrolled.

e. The acceptable minimum site size for a combination of any of these school organizations is the highest minimum recommended.

204 *Physical Features:*

204.01 Ordinarily, satisfactory arrangements of building and outdoor areas can be achieved on a rectangular site with dimensions in a ratio of approximately three to five.

204.02 The ideal contour for a site is a slightly convex surface with the high point at the position where the building is to be located; however, a site with perfect contour is seldom found, and reshaping or grading is usually necessary.

204.03 In order that a building be planned in relation to final contours rather than the existing ones, it is essential that the development of the site be planned before or during the preliminary planning stage.

204.04 Subsoil conditions should be determined by adequate test borings and soil analysis before the building is designed.

204.05 Prior to the purchase of a site, the history of the area should be examined to determine whether mining activities either past, present, or contemplated may cause changes in the bearing qualities of the soil or in the water supply. Consult with the State Division of Mines and with engineering departments of local mining companies prior to the purchase of a site.

204.06 In rural and suburban areas, prior to the purchase of a school site, contact the local and state health departments to determine whether adequate water supply and sewage disposal may be secured on the site.

204.07 If the site is acceptable on both counts, the health department, state or local, will provide information regarding the required type and location of sewage disposal system.

204.08 In addition to contacting the state and local health department, the Public-Service District should be contacted in suburban areas to determine whether sanitary sewers are contemplated in the area.

204.09 The site should permit economical location of the building or buildings, sufficiently removed from roads and streets to minimize traffic noises and to avoid traffic hazards at entrances and exits.

204.10 The buildings should be located on a site in a manner which will permit the maximum utilization of the entire area for outdoor educational and recreational activities and the development of these various activity areas in proper relationship to buildings and to each other.

205 *Recreational Areas:*

205.01 The selection of particular areas will depend upon the type of school center to be served, the community facilities available, the geography of the area, the climate, the extent to which the school site can be devoted to recreation, the ultimate size of the center, and the type of soil and natural features of the area.

205.02 Field and court dimensions are indicated for a variety of recreational and physical education activities in Table 1.

205.03 In smaller schools one field may be used for football, soccer, and hockey and scheduled so as to serve the different age and sex groups at different periods.

TABLE 1
FIELD AND COURT DIMENSIONS

Activity	School		
	Elementary	Junior High	Senior High (Adults)
Baseball			350′x350′
Basketball	40′x60′	42′x74′	50′x84′
Football & Track*			300′x600′
Football, Six-man			120′x300′
Football, Touch		120′x300′	160′x360′
Hockey, Field			180′x300′
Hockey, Ice			85′x200′
Softball**	150′x150′	200′x200′	250′x250′
Soccer			165′x300′
Volleyball	25′x50′	25′x50′	30′x60′
Archery		50′x150′	50′x300′
Badminton			20′x44′
Handball	18′x26′	18′x26′	20′x40′
Horseshoes		10′x40′	10′x50′
Shuffleboard			6′x52′
Tennis		36′x78′	36′x78′
Tennis, Deck			18′x40′
Tennis, Paddle			20′x44′
Tetherball	10′ circle	12′ circle	12′ circle

* Assumes 220-yard straightaway
**Varies according to ball size

205.04 The surfacing of selected outdoor recreational areas will permit greater all-weather use of these spaces thus relieve overcrowding, particularly in elementary schools of indoor physical education facilities.

205.05 Apparatus areas should be:

a. Segregated from the general open playing area.
b. Arranged so that apparatus may be used safely, is accessible, and can be easily supervised.
c. Surfaced with resilient material under fixed apparatus.

205.06 The play area for small children should be placed in relation to the school building so that these children need not cross a playing field assigned to older children.

206 *Walks, Drives, and Parking:*

206.01 Service areas should be located so as not to interfere with pupil traffic between building and play area.

206.02 For convenience and safety, access for pedestrians from the highway or street to the building should have first and dominant consideration; then, access for persons arriving by public conveyance, school bus, and by private cars; and finally, access for deliveries of provisions, supplies, and materials and removal of wastes and garbage.

206.03 Walks should provide direct connections, be convenient, and follow natural routes. The width of the walks should be in multiple lanes approximately 22 inches wide, a minimum of three lanes.

206.04 Drives should not serve the dual purpose as drives and walks; they should be distinctly and effectively separated.

206.05 Driveway layouts should be direct and logical solutions to the problem. They should follow the most direct routes consistent with good alignments, grades, and harmonious relationship with adjacent surroundings.

206.06 A two-lane drive leading to the main point of discharge connecting with or ending at a parking area, is usually the best solution. *No driveway should encircle the building;* and, if possible, all intersections of drives and walks should be avoided.

206.07 When a U-shaped drive is provided in front of the school building, it should be restricted to one-way traffic and be a minimum width of 20 feet.

206.08 A school bus platform should be arranged at a strategic point and generally separated from other traffic on the school grounds. The arrangement should permit school buses to be driven directly to the platform, loaded and unloaded from the right side, with no crossing of foot traffic near the buses.

206.09 It is highly important that buses move or circulate on the site without backing up.

207 *Site Beautification:*

207.01 Plans for beautification and utilization of school grounds should be developed simultaneously with the plans for the building.

207.02 Visual comfort and efficiency may be conditioned by the careful utilization of the trees, plants, scrubs, and grass.

207.03 The classes of plants generally used on school grounds are: shade trees, small ornamental trees, coniferous evergreens, bud-leaf evergreen scrubs, deciduous flowering scrubs, vines, and ground covers. Plants should be grouped according to height, color, and plant-culture requirements.

207.04 Well planned site plantings for individual schools should be prepared with the assistance of qualified personnel such as landscape architects, nurserymen, etc.

NOTE: Personnel at West Virginia University will assist school districts in planning for site beautification.

207.05 Each school site should have a master plan for plantings approved by the board of education. Plantings provided by citizens and/or pupils in the school district should be in accordance with the approved plan and should be sanctioned by the board of education prior to the expenditure of money for such plantings.

Chapter 3

THE ELEMENTARY SCHOOL

300 *References: Guide*—pp. 36-74.

301 *Size of Centers:*

301.01 It is recommended that elementary school centers be organized for educational program and administrative purposes according to the following enrollments:

a. Elementary schools housing grades one through six should have an enrollment of at least 180 pupils and not more than 540 pupils.

b. Elementary schools housing grades one through eight should have an enrollment of at least 240 pupils and not more than 700 pupils.

c. Kindergarten and special class enrollments would be in addition to the above figures.

302 *Planning Process:*

302.01 Certain physical facilities are considered essential to maintain the educational programs in larger elementary school centers. It is assumed that similar facilities, modified in size and/or by combined use, should be provided in smaller elementary school centers. Table 2 indicates the facilities considered essential to the implementation of adequate elementary educational program and are stated for the various sized elementary school centers.

302.02 For the purpose of outlining educational specifications, it is assumed that the elementary school offers instruction in a program which is not departmentalized; that is, basic instructional activities are accommodated in a classroom or learning laboratory for the exclusive use of teacher and a group of pupils, rather than special classrooms designed for mathematics, language arts, social studies, etc. The interpretation need not conflict with the school organized and providing special personnel for supervision and assistance in the instruction of music, art, and physical education nor does it exclude the use of specialized facilities for these activities.

TABLE 2
PHYSICAL FACILITIES CONSIDERED ESSENTIAL FOR VARIOUS SIZED ELEMENTARY SCHOOL CENTERS

ENROLLMENT			PHYSICAL FACILITY
180	360	540	
			A. Site
			B. The Building
			1. Classrooms for:
			a. Nursery school
			b. Kindergarten
X	X	X	c. Primary
X	X	X	d. Intermediate
			e. Extended outside
			2. Classrooms (special)—
			a. Remedial
			b. Special education
			3. Specialized areas:
@	@	O	a. Auditorium
@	@	O	b. Physical education room
			c. Cafeteria:
@	@	C	(1) Dining
X	X	X	(2) Kitchen
X	X	X	(3) Serving
X	X	X	(4) Storage
X	X	X	(5) Employee comfort
			d. Administrative:
X	X	X	(1) Principal's office
X	X	X	(2) Reception room
#	#	#	(3) Duplicating room
X	X	X	(4) Health unit
X	X	X	(5) Conference, special instruction room
X	X	X	(6) Storage
X	X	X	(7) Professional employee comfort
#	#	#	e. Library:
			(1) Reading room
			(2) Book storage room
			(3) Workroom
			(4) Conference room
X	X	X	f. Toilets
			g. Custodial:
X	X	X	(1) Receiving, storage, and workroom
X	X	X	(2) Outside storage for lawn tools and equipment
#	#	#	h. Storage room for instructional supplies (materials center)
#	#	#	i. Musical instrument storage room
#	#	#	j. Audio-visual equipment storage room
X	X	X	k. Heating plant and fuel storage room
			4. Service facilities
X	X	X	a. Light
X	X	X	b. Heat and ventilation
			c. Telephone
X	X	X	d. Water
X	X	X	e. Sewerage

SYMBOLS IN TABLE REPRESENT:

X Facility(ies) provided in each center. Illustration: A center housing 180 pupils in grades one through six will generally require six classrooms—three primary and three intermediate.

@ Facility(ies) provided in each center; however, multiple use may be made of a single space. The space must be designed and equipped to permit its use for various purposes during the school day.

O Facility(ies) provided in each center; but combined only if analysis of educational program permits multiple use of a single space; otherwise, separate units should be provided.

C Separate facility provided in each center, but should be planned to accommodate other compatible activities, such as primary physical education, arts and crafts, library, or music activities.

# Facility(ies) should be provided in each center. Note: Planning may permit combining areas; however, the educational program housed in the building will determine the effectiveness of such a combination.

303 *Kindergarten:*

303.01 Size: Base preliminary determination of kindergarten area upon the allotment of 40 square feet per child. For example, if 30 pupils are to be housed in the kindergarten, 1,200 square feet of floor area should be planned. To more accurately determine the area, trial room layouts should be made using scale templates representing furniture and equipment and scale drawings of floor and wall elevations.

303.02 Capacity: Maximum, 30 pupils.

303.03 Location:

a. Ground floor with easy access to an entrance not generally used by older children.
b. Direct access to segregated outdoor play area.
c. Area of the building which permits maximum natural light.

303.04 Activities: Major study activities include: number and reading readiness, units of work on areas of immediate interest; music and rhythmic activities; indoor and outdoor recreation and physical education; conversation, discussion, listening activities, creative activities with various media.

303.05 Equipment and facilities: Ample space, movable furniture and equipment, and well-designed storage areas are essential.

a. Work area:
    (1) Work bench of suitable size.
    (2) Tool cabinets.
    (3) Sink with hot and cold water.
    (4) Storage space for materials.

b. Art center:

  - (1) Independent easels.
  - (2) Table with waterproof top.
  - (3) Storage for clay, construction paper, and other art materials.

c. Science and nature:

  - (1) Aquarium and terrarium.
  - (2) Space for display of nature and science material.
  - (3) Storage space for equipment needed for simple experiments.

d. Library corner:

  - (1) Alcove located near windows.
  - (2) Library table and chairs.
  - (3) Low, open book shelving suitable for large format books.

e. Music area:

  - (1) Small movable piano.
  - (2) Record player.
  - (3) Record storage space.

f. Teacher's area:

  - (1) Desk and chair.
  - (2) Additional chairs for adult visitors.
  - (3) Filing space for pupils records and teaching materials.
  - (4) Storage space for teacher's personal belongings.

g. Main Activity area:

  - (1) Suitable number of small chairs for pupils.
  - (2) Indoor play equipment which can be used in this area.

h. Pupil Wrap Storage:

  - (1) Nook or compartment type.
  - (2) Hanging pole for coats or cloak hooks, approximately three and one-half feet above the floor.
  - (3) Upper and lower shelves for hats and overshoes.

i. Toilet facilities:

  - (1) Direct access to the main kindergarten room and outdoor play area.
  - (2) Ample light and ventilation.
  - (3) Suitable number of fixtures.
  - (4) Sinks for hand washing should be conveniently located for use as well as for supervision by the teacher.

j. Chalkboard and tackboard:
   (1) Sixteen to 20 linear feet of chalkboard.
   (2) As much tackboard as possible, a portion of which should be a height accessible to the pupils.
   (3) Provide map and display rail above both chalkboard and tackboard.

k. Services:
   (1) Provide electrical receptacles on all walls.
   (2) Special consideration should be given to the heating system design so that, if possible, the floor may remain warm at all times.
   (3) As this space will inevitably be one of the noisy areas of the building, special acoustical treatment should be considered.

304 *Classrooms:*

304.01 Size: Base preliminary determination of area upon the allotment of 30 square feet per child. For example, if 30 children are to be housed in this classroom, 900 square feet of floor area should be planned. To accurately determine the area needed, trial room layouts should be made using scale templates representing furniture and equipment and scale drawings of floor and wall elevations.

NOTE: When possible, consideration should be given providing primary classrooms larger than suggested figure.

304.02 Capacity: Maximum, 30 pupils.

304.03 Location:

a. Remove from noisy areas of the building.
b. Convenient access to the out-of-doors, particularly recreational and physical education areas.
c. If building is two or more stories, primary grades should be assigned first floor classrooms.

304.04 Activities: Individuals and groups engaging in: study and work activities; experimenting; problem-solving situations; using audio-visual aids; using a variety of reference materials; developing cultural skills; displaying pupils' work, etc.

304.05 Equipment and Facilities:

a. Appropriate number of desks and chairs or combination desk-chairs, adjustable in height.
b. Chalkboard: 24 to 30 linear feet, a portion of which should be extended to within six to eight inches of the floor; display and chart rail above.
c. Tackboard: As much as possible, a portion of which should extend to within six to eight inches of the floor; display and chart rail above.

d. Pupil wardrobes: May be provided in one of the following fashions:
   (1) Recessed area in classroom or corridor, or in adjacent room separated by folding door or partial partition with coat strip attached to wall and shelf above cloak hooks.
   (2) Steel lockers built in the corridor or classroom wall.
   (3) Movable wardrobes, light enough to permit movement from one area of the room to another.

e. Storage:
   (1) Thirty linear feet, each, of open and closed adjustable shelving of various height and depth for a variety of sized construction paper, charts, large format books, etc.
   (2) Storage for teacher's personal belongings.
   (3) Filing space for instructional materials and supplies equivalent to four-drawer, legal-size file cabinet.

f. Work space: Approximately six linear feet of work area equipped with sink and hot and cold water.

g. Electrical outlets: All four walls, if possible.

h. Teacher's combination table-desk and chair.

i. Portable aquarium and terrarium.

j. Conference-work table and six to eight chairs of appropriate size.

304.06 The general layout of equipment in this room should permit the establishment of several work centers including group work, study, and recitation center; library center; construction and art activity center; science center; and teacher's center.

305 *Multipurpose Room:* The provision in an elementary school of a so-called multipurpose room is common practice. Activities assigned this space usually include physical education, music, assembly, and food service. An unfortunate self-deception has been indulged in the design of multipurpose facilities and certain activities are shortchanged. Initial planning should be based upon simple arithmetic of the amount of time required for the separate program activities to be housed. The omission of certain activities should be the result of deliberate decisions.

305.01 Size: Base preliminary determination of multipurpose room area on the allotment of six to eight square feet per pupil enrolled in the school. For example:

a. School centers housing 180 pupils require approximately 1200 square feet.

b. School centers housing 360 pupils require approximately 2400 square feet.

c. School centers housing 540 pupils require approximately 4000 square feet.

d. To more accurately determine the area needed, a detailed description of the programs to be housed and the furniture and equipment to be used should be prepared. Trial room layouts should be made using the scale templates representing the furniture and equipment and scale drawings of the floor and wall elevations.

305.02 Capacity:

a. Assembly capacity is determined on the basis of six square feet per person.

b. Food-service dining capacity is determined on the basis of ten to twelve square feet per person.

c. Physical education capacity is two-class sections or 60 pupils.

305.03 Activities: Assembly for dramatics, music, and other stage productions; physical education in the form of individual and group activities; dining associated with the school lunch program; and choral and instrumental practice.

305.04 Location:

a. Removed from quiet areas of the building by location and/or acoustical treatment.

b. Direct access to outdoor physical education or recreation areas.

c. Convenient access to public parking areas.

d. Direct access to service drive from food preparation unit adjacent to the multipurpose room.

305.05 Equipment and Facilities:

305.051 Dining facilities:

a. Tables and benches or chairs, appropriate in number, with provision for quick conversion from dining to assembly or physical education purposes.

b. Adequate sound and odor barriers between dining room and kitchen-serving area.

c. Convenient and safe traffic patterns to and from the serving area and to soiled dish-return windows.

305.052 Stage:

a. Six hundred to 700 square feet of permanent or portable stage area.

b. Two entrances to the stage, one direct from the building corridor.

c. Stage location should be one which makes classrooms conveniently accessible for use as stage dressing rooms.

d. Proscenium opening should be approximately one-half the width of the body of the multipurpose room.

e. Stage curtains, cyclorama, and film projection screens should be part of the stage equipment.

f. Four to six duplex electrical receptacles should be provided in the stage area.

305.053 Chair and table storage:
a. Area as needed for storage for tables and chairs used for dining purposes.
b. Provision of ample space to accommodate assembly chairs stored on trucks.

305.054 Equipment storage:
a. Approximately 200 square feet with convenient access to the outdoor physical education area and direct acess to multi-purpose area.
b. Provide double doors with flush threshold.
c. Shelving and cabinets for storage of miscellaneous types of physical education and other equipment.

305.055 Public toilets:
a. If pupil toilets are not located conveniently accessible for public use, two toilets of approximately fifty square feet, each, should be provided.

305.056 Kitchen and auxiliary spaces: Refer to pages 59, 118-119, 136-140 in the *Guide* and Section 414 in the *Handbook.*

306 *Administrative and Service Facilties:*

306.01 General office and waiting room:

306.011 Size: 150 to 250 square feet, to serve for both secretarial and waiting space.

306.012 Location: Direct access to the principal's office and building corridor.

306.013 Equipment and facilities:
a. Appropriate number of teachers' mailboxes.
b. Comfortable chairs in waiting area.
c. Tackboard: four to six linear feet.
d. Book shelf and magazine rack.
e. Desk and chair for secretary.
f. Work table.
g. Typewriter stand.
h. Fire-safe record files.
i. Coat rack with shelf for hats.
j. Electrical outlets on all four walls, if possible.

306.02 Principal's office:

306.021 Size: 100 to 125 square feet.

306.022 Location:
- a. Direct access to general office and waiting room and to building corridor.
- b. Convenient access to other areas in the administrative suite.
- c. Location and acoustical treatment to prevent conversations from being overheard in adjacent areas.

306.023 Facilities and equipment:
- a. Principal's desk and chair.
- b. Three chairs, adult size.
- c. Telephone and call service to general office.
- d. Ten to 20 linear feet of book shelving.
- e. Four-drawer, legal size filing cabinet.
- f. Electrical outlets on four walls, if possible.

306.03 Book supply and office work room:

306.031 Size: 150 to 250 square feet.

306.032 Location: Direct or convenient access to the general office and waiting area.

306.033 Equipment and facilities:
- a. Adjustable shelving of various heights and widths for a variety of books and instructional supplies.
- b. Large table for duplicating machine and for layout work.
- c. Sink with mixing faucet and hot and cold water.

306.04 Conference room—small group and individual instruction room:

306.041 Size: 150 to 250 square feet.

306.042 Location: Convenient access to principal's office and direct access to general office and waiting room.

306.043 Equipment and facilities:
- a. Conference table and eight to ten chairs.
- b. Four linear feet of chalkboard and equivalent amount of tackboard.
- c. Electrical outlets on four walls, if possible.
- d. Should this area be used for small group or individual instrumental instruction, special acoustical treatment will be needed.

306.05 Health service unit:

306.051 Size: 200 to 300 square feet.

306.052 Location:
- a. Convenient or direct access to the general office and waiting area.
- b. Direct access to building corridor.

306.053 Equipment and facilities:
- a. Small toilet area with water closet and lavatory.
- b. Desk and chair.
- c. Four linear feet of tackboard.
- d. Two cots with dividing curtain or screen between.
- e. Storage area for nurses' personal belongings.
- f. Storage cupboard for first aid equipment and supplies.
- g. Scales, sterilizer, etc.

306.06 Toilet:

306.061 Size: 30 to 50 square feet.

306.062 Location: Conveniently accessible to administrative area.

306.063 Equipment and facilities: Water closet, lavatory, and mirror.

306.07 Teachers' rest room:

306.071 Size: Approximately 150 to 250 square feet.

306.072 Location: Conveniently accessible to the administrative area.

306.073 Equipment and facilities:
- a. Provide combination lounge facilities for men and women.
- b. Provide separate toilet facilities for each sex, with entrance to each facility removed from the common lounge area.

307 *Custodial and Engineering Rooms:*

307.01 Heat plant:

307.011 Size: Area as needed.

307.012 Location:
- a. Directly accessible to service drive.
- b. Isolated from pupil-occupied areas by location and/or treatment.

307.013 Equipment and facilities: As needed, provision to permit expansion if necessary.

307.02 Receiving, Storage, and Work Room:

307.021 Size: 200 to 300 square feet.

307.022 Location: Direct access from the service drive.

307.023 Equipment and facilities:
- a. Variety of shelving in depth and height to provide temporary storage for supplies and equipment delivered to the school and custodial equipment not used daily, such as ladders, vacuum cleaners, scrubbers, etc.
- b. Provide work bench equipped with vise and storage for small hand and power tools used in minor repair.

307.03 Lawn tool-equipment storage room:

307.031 Size: 50 to 100 square feet.

307.032 Location: Direct access from the out-of-doors.

307.033 Equipment and facilities: Shelving and space to permit easy storage of lawn mower, lawn tools and other equipment needed in the care of the school grounds.

307.04 Power, Meter, and Switch Room:

307.041 Size: Area as needed.

307.042 Location:
- a. Convenient access from the boiler room and custodian's room.
- b. Location to avoid damage from water or moisture.

307.043 Facilities and equipment: Electrical panels, meters, and switches needed to provide electrical service in the building.

307.05 Incinerator and waste room:

307.051 Size: Area as needed.

307.052 Location: Easy access from the custodian's room and heating plant.

307.053 Equipment and facilities:
- a. Containers for temporary storage of waste.
- b. Incinerator large enough to dispose of a day's accumulation of waste. If the incinerator is to accommodate wet garbage, competent technical assistance should be secured in the designing of the facility.

307.06 Custodial closets:

307.061 Number and size: As needed.

307.062 Location: Strategically located along corridors and in food-service area to reduce the travel necessary to properly maintain and operate a healthy and clean school.

307.063 Equipment and facilities:
- a. Service sink with hot and cold water.
- b. Shelving for various cleaning supplies and equipment.
- c. Storage space for mops, brooms, etc.

430.052 Location:
- a. Convenient access to the general office.
- b. Direct opening to corridor through "dutch-door" or window to permit distribution of books and supplies.

430.053 Activities: Storage and distribution of instructional mateials and supplies including books, paper, notebooks, erasers, pencils, etc.

430.054 Equipment and facilities:
- a. Cabinets and shelving for books and other school supplies and materials.
- b. Desk and chair.
- c. Work counter or table space.
- d. Filing space.
- e. (Optional) Small wall safe for temporary storage of small sums of money and other valuables.

430.06 Record Vault (Optional):

NOTE: This facility may be eliminated by providing fire-resistant filing cabinets in the general office or other storage area.

430.061 Size: Fifty to 75 square feet.

430.062 Location:
- a. Direct or convenient access from the general office.
- b. Direct or convenient access to guidance and health area.

430.063 Activities: Storage of current and former pupil records.

430.064 Equipment and facilities:
- a. General construction should be fire-resistant.
- b. Movable cart storage units, preferable for current records of pupils enrolled in school.
- c. Storage for permanent records of former pupils, may be in filing cabinets or in other suitable filing devices.

430.07 Conference room:

430.071 Size: Two hundred to 300 square feet.

430.072 Location:
- a. Convenient access to general office, principals' offices, counselors' offices, and the public-address system control room.
- b. Design and location should permit groups to confer without being overheard in adjacent rooms.

430.073 Activities: Conferences involving five to 12 people and program broadcasts to instructional areas.

430.074 Equipment and facilities:
- a. Conference table and chairs.
- b. Six to eight linear feet of chalkboard.
- c. Four to six linear feet of tackboard.
- d. Glazed panel between conference area and public-address system control room.
- e. Forced ventilation.

430.08 Public-address system control room:

430.081 Size: Seventy-five to 100 square feet.

430.082 Location:
- a. Adjacent to conference room.
- b. Convenient access to general and principals' offices.

430.083 Activities: The distribution of information and educational programs within the school.

430.084 Equipment and facilities:
- a. Common partition between this room and the conference room should be glazed. Equip with draperies for isolation of conference room when used for other purposes.
- b. Adequate sound and electrical outlets in conference and control room.
- c. Public-address control system panel with orientation toward conference room.
- d. Storage facilities for audio supplies and equipment such as records, tape recordings, sound effects, microphone stands, and similar equipment.

NOTE: *The following facilities should be closely related to the administrative facilities for internal communication purposes, such as sharing pupil records and using of conference room facilities; however, separate entrances and waiting areas may be provided.*

430.09 Counselors' offices:

430.091 Size: One hundred to 125 square feet.

430.092 Location:
- a. Direct access from waiting area and convenient access to conference room and general office in the administrative suite.
- b. Design and location should permit conferences without voices being overheard in the adjacent areas.

430.093 Activities: Individual and group guidance, counseling, and conferences with pupils, parents, and teachers.

430.094 Equipment and facilities:
- a. Desk and chair.
- b. Conference chairs.

c. Ten to 15 linear feet of shelving.
d. Four to six linear feet of tackboard.
e. Storage for personal belongings.
f. Telephone communications with general office and call system to secretary.

430.10 Health Service Unit:

430.101 Size: Three hundred to 400 square feet.

430.102 Location: Direct access from waiting area and from building corridor to permit traffic to pass through the area for various screening tests.

430.103 Activities: Examinations by nurses, doctors, dental hygienists, etc.; administration of first aid.

430.104 Equipment and facilities:
a. Small room or curtained area for each sex, to permit rest and isolation in case of sickness.
b. Tackboard.
c. Toilet and lavatory with hot and cold water.
d. Scales, medicine chest, sterilizer, etc.
e. Storage for bed linens.
f. Storage closet for nurses' personal belongings.

430.11 Waiting room: (Optional)

430.111 Size: One hundred to 150 square feet.

430.112 Location: Direct access to counselor offices and health unit.

430.113 Activities: Reception of and browsing by pupils and parents.

430.114 Equipment and facilities:
a. Secretarial desk and chair.
b. Typewriter and typewriter stand.
c. Comfortable chairs.
d. Book and magazine shelving for variety of occupational information and college bulletins.
e. Filing cabinet for occupational information not displayed on racks.

430.12 Teachers' lounge:

430.121 Size: Two hundred to 300 square feet.

430.122 Location:
a. Direct access from a building corridor.
b. Convenient access to staff toilets.

c. Location avoiding major pupil traffic, yet reasonably close to the administrative area.
d. Toilets should not have direct opening into the lounge area.

430.123 Equipment and facilities:
a. Comfortable lounge furniture.
b. Kitchenette to prepare light refreshments (optional).
c. Adequate ventilation.

430.13 Staff toilets (one for each sex):

430.131 Size: Fifty to 75 square feet, each.

430.132 Location:
a. Near an administrative and special-service areas, convenient to teachers' lounge, but direct access from a building corridor.

431 *Auditorium:* Factors influencing the location of the auditorium include: Ground level position easily shut off from other areas of the building, convenient access to language arts classrooms, convenient access to physical education dressing-locker rooms to permit use as stage-dressing rooms, convenient access to service drive for the delivery of bulky properties, location so that community groups may use facility during the school day without interferring with school activities, and location which permits planned multiple use of lobby area, and convenient access to public parking facilities. Consider accessibility of pupil toilets for public use and classrooms for coat check areas during use in after-school hours.

NOTE: Although less desirable these facilities are frequently combined with physical education facilities.

431.01 Body of auditorium:

431.011 Size: Dependent upon ultimate seating capacity desired and singular or multiple use of the facility. Approximately six square feet will be needed for each seat provided.

431.012 Capacity: Dependent upon desire to seat entire student enrollment or portion of the student enrollment at one time.

431.013 Activities:
a. Production and performance of various student plays, operettas, variety shows, etc.
b. Performances before student audiences by visiting groups or individuals contributing to the educational program of the school.
c. Multiple use of the area for instructional purposes—large and small group instruction etc.

431.014 Equipment and facilities:

- a. Space in front of the auditorium for orchestra, band, and other activities.
- b. Acoustical qualities so that weak voices of some platform participants may be heard throughout the auditorium.
- c. Facilities whereby programs originating in the auditorium may be broadcast throughout the school.
- d. Sound amplification controls should be located in projection niche or booth.
- e. Convenience lights arranged and located for partial illumination during performances.
- f. Light control by multi-way switches convenient to entrances, near stairs to the stage and projection booth.
- g. Convenience and pilot light circuits should be tied into main light-control panel for control during productions.
- h. Duplex electrical outlets, appropriate in number, should be provided:
  - (1) Along front of stage apron.
  - (2) At rear of the body of the auditorium.
  - (3) About one-third the distance from the stage to the rear of the auditorium for use with various audio-visual projectors.
- i. Projection niche (optional) at the rear of the room for use of 16 mm film projector.
- j. Speakers for use with projector located in the rear of the seating area.

431.02 Lobby:

431.021 Size: Area as needed to handle anticipated crowds.

431.022 Location: To serve as common lobby for auditorium and gymnasium if facilities are provided in separate units, or may be used as common lobby with other public service areas.

431.023 Activities: In addition to serving as a gathering area for large groups attending affairs in the auditorium and/or gymnasium, this facility may also serve as a student commons.

431.024 Equipment and facilities:

- a. See description, No. 409.02.

431.03 Stage:

431.031 Size: Fourteen hundred to 1600 square feet.

431.032 Location:

- a. Provide ample wing space on each side of the stage.
- b. Access to the stage and building corridor without entering body or lobby of the auditorium.

431.033 Equipment and facilities:

- a. Apron in front of the main curtain, approximately eight feet wide, with direct access to the body of the auditorium at each end.
- b. Stage must be free of partitions.
- c. Wide double doors with flush threshold opening onto the stage to permit passage of bulky properties.
- d. Hardwood floor for the apron and the stage and soft wood floor for the backstage and wing areas.
- e. Electrical circuits included:
  - (1) Border with roundels of four different colors.
  - (2) Circuits for adjustable spotlights mounted on at least two battens.
  - (3) Flush floor pockets or equivalent mounted in floor behind cyclorama with at least one outlet directly behind proscenium arch on each side.
  - (4) Duplex electrical outlets mounted near floor on walls of stage.
    NOTE: Flood lights are not needed.
  - (5) Stage work lights controlled by multi-way switches at stage entrances, stairs from the body of the auditorium and tied into the light panel for positive control during productions.
- f. Provide panel for controlling stage and house lights including beam and spotlights mounted in the ceiling of the auditorium.
- g. Light control panel designed to avoid overloading of circuits and resulting dimmer damage; and should be flexible and expansible.
- h. Means for mounting 10 to 12 foot roll-up motion picture screen.
- i. Microphone outlets to the rear of the proscenium arch and two or three under the leading edge of stage apron.

431.04 Stage-crafts—workshops—storage:

431.041 Size: Three hundred to 400 square feet.

431.042 Location: Direct access to the stage wing yet arranged to prevent noise interference on the stage.

431.043 Activities: Prepare, alter, and store materials, such as stage flats and other properties, store general purpose equipment used for auditorium programs.

431.044 Facilities and equipment:

- a. Double doors with flush threshold.
- b. Ten linear feet of work-counter approximately 30 inches deep, with storage under.

c. Tool cabinet.
d. Sink with hot and cold water.
e. Movable storage cabinets for stage properties.
f. Electrical outlets on available wall space including area over work bench.
g. Six linear feet of tackboard.
h. Storage for flats of various widths, appropriate for height of the proscenium arch.
i. Storage for grand piano, costumes, stage properties, lighting and projection equipment.

432 *Food-Service Facilities:* Items influencing location of these facilities include: Ease in delivery of supplies and equipment and disposal of wastes; isolation from other portions of the building for after-school-hour activities with or without food service; and accessible to physical education facilities so that large groups may be served.

432.01 Dining rooms:

432.011 Size: Base preliminary determination of allotment on 10 to 12 square feet per pupil seated at any one time. Provisions for subdividing large areas should be considered.

432.012 Location:
a. Direct access from the building corridor.
b. Convenient access from library-instructional materials center.
c. Isolation by location and/or sound barriers from noisy areas of the building and the site.
d. Maximum utilization of natural beauty in the vicinity.
e. Complete separation from both food preparation and serving areas.

432.013 Activities: Dining during school and after-school hours, study, and may be considered as space for assembly or large group instruction purposes.

432.014 Equipment and facilities:
a. A variety of tables and chairs suitable for dining as well as study purposes.
b. Temporary storage for pupils' personal belongings convenient for pupils approaching serving lines.
c. Electrical and microphone outlets.
d. Double doors with flush threshold to accommodate two-way traffic.
e. Drinking fountains in the dining area or convenient to the dining room.

f. If facilities are used for study purposes, provide space for an unabridged dictionary, abridged dictionaries, and encyclopedias; locate to permit isolation from dining room traffic during noon and after-school use.

432.02 Teachers' dining and student conference room:

432.021 Size: Two hundred fifty to 350 square feet.

432.022 Location:

a. Convenient access to serving area, building corridor, and general dining area.

432.023 Activities: Dining and meetings of teacher and staff members; committee work by pupils.

432.024 Equipment and facilities:

a. Tables and chairs suitable for dining and study purposes.

b. Eight to 10 linear feet of chalkboard.

c. Four linear feet of tackboard

d. Glazed panel between this area and the dining room to permit ease of supervision; equip with draperies to permit isolation when supervision is not necessary.

432.03 Kitchen and auxiliary facilities:

432.031 Kitchen:

a. Size: Dependent upon number of meals served during the school day, approximately two square feet per meal served, a minimum of 300 square feet.

b. Location:

(1) Easy access to pupils in the serving line.

(2) Direct access from the outside of building for delivery of supplies and equipment, and disposal of wastes.

(3) To facilitate the serving of large community gatherings in this space or in the physical education area.

c. Equipment and facilities:

(1) Small bulletin board near entrance.

(2) Floor should be easily cleaned, nonskid material with properly located floor drains.

(3) Wall and ceiling surfaces should be readily maintained and not affected by steam or heat.

(4) Adequate ventilation is essential for convenience of workers and to reduce food-odor penetrations into dining area.

(5) Adequate built-in and movable equipment for the efficient, sanitary preparation and serving of food.

(6) Hand lavatory.

432.032 Food storage:

- a. Size. Minimum one-half square foot per meal served. (See Section 607.02)).
- b. Location:
  - (1) Immediate access to receiving area.
  - (2) Convenient access to food preparation area.
- c. Equipment and facilities:
  - (1) Area must be dry, cool, and rodent proof throughout; therefore, heating pipes, water heaters, and compressors should not be located in this area.
  - (2) Adequate ventilation from out-of-doors.
  - (3) Maximum amount of shelving, limit height to seven feet six inches.
  - (4) Storage at floor level for large sacks of commodities on portable platforms or in covered containers on dollies.

432.033 Nonfood storage:

- a. Size: Forty to 60 square feet.
- b. Location: Immediate access from food preparation and storage areas.
- c. Function: Provide storage of soaps, detergents, wetting agents, and other cleansing supplies and equipment required in the daily operation and maintenance of the food-service center.
- d. Equipment and facilities: Custodian's service sink and a variety of shelving.

432.034 Locker-dressing room:

- a. Size: Seventy-five to 100 square feet.
- b. Equipment and facilities:
  - (1) Lockers.
  - (2) Mirror.
  - (3) Two or three chairs or bench.
  - (4) Toilet and lavatory.

432.035 Serving area:

- a. Size: Dependent upon the number of meals to be served at any one time. Number of such areas, equally, is dependent on number of meals to be served.
- b. Location:
  - (1) Provide for convenient flow of food from kitchen, dishes from dishwashing area.
  - (2) Efficient flow of pupils from serving line with minimum congestion and movement of personnel across traffic lines.
  - (3) Isolation from dining area.

c. Equipment and facilities:
  - (1) Serving counter includes tray, silverware, hot food, cold food, and milk service sections.
  - (2) Provide health guards, tray rail, menu board, and cashier's section with knee space.

432.036 Waste-disposal area:

a. Size. One hundred to 150 square feet.

b. Location: Direct or convenient access from kitchen and delivery platform.

c. Facilities and equipment:
  - (1) Space for garbage containers.
  - (2) Space for temporary storage of boxes, tin cans, etc.
  - (3) Floor drain.
  - (4) Hose bibb with hot and cold water.
  - (5) Proper ventilation and screening essential.

432.037 Receiving and office area:

a. Size: Seventy-five to 150 square feet.

b. Location: Near service entrance, yet provide for direct supervision of kitchen area.

c. Equipment and facilities:
  - (1) If separate room, provide partial glazed partition between this area and kitchen.
  - (2) Counter or table for temporary storage of certain deliveries.
  - (3) Desk, chair, and telephone service.
  - (4) Filing space.

433 *Library or Instructional Materials Center:* Factors influencing the location of this center include: Isolation from noisy areas of the building, convenient access to general purpose (academic) classrooms, and to the dining area.

433.01 Reading room:

433.011 Size: Twenty-five to 30 square feet per reader.

433.012 Capacity: Fifteen per cent of the total student body up to an enrollment of 500 and 10 per cent for an enrollment of more than 500 pupils.

433.013 Location: See factors mentioned in general comment about this center.

433.014 Activities: General reading; reference and research work with encyclopedias, books, dictionaries, maps, charts, globes, pamphlets, pictures; browsing; viewing displays; charge-out of materials; class instruction in the use of the library.

433.015 Equipment and facilities:
- a. Circulation desk.
- b. Tables of various sizes and shapes and chairs.
- c. Librarian's work counter.
- d. Card catalogue case.
- e. Map, globe, newspaper and magazine storage.
- f. Legal-size filing space.
- g. One or more sloping-top reference stands for dictionary, atlas, and other large books.
- h. Book and book-return trucks.
- i. Ten to 14 linear feet of tackboard, sections mounted near entrance and display case.
- j. Display case visible from both corridor and reading room.
- k. Informal reading area—used as a browsing center for six to eight patrons with lounge-type furniture.
- l. Movable shelving units should extend not more than six feet from the floor in junior high schools and seven feet feet from the floor in high schools. Shelving should be adjustable, upper and lower shelves should be constructed to adjust the angle so titles of books may be easily read.
- m. Electrical outlets should be provided along available wall space.
- n. Acoustical treatment in this area is essential.

433.02 Librarian's office-workroom:

433.021 Size: One hundred to 200 square feet.

433.022 Location:
- a. Direct access to charge-out desk.
- b. Convenient access to storage room.
- c. Provide for ease in supervision of reading room.

433.023 Activities: Conferences, typing, telephoning, mending books, reinforcing magazines, etc.

433.024 Equipment and facilities:
- a. Librarian's desk and chair.
- b. Conference chairs.
- c. Typewriter, typewriter stand, and typing chair.
- d. Legal-size filing cabinets.
- e. Telephone.
- f. Two to three electrical outlets.
- g. Six to 10 linear feet of work counter, and sink with hot and cold water, storage both above and beneath work counter.

433.03 Storage room:

433.031 Size: One hundred fifty to 300 square feet.

433.032 Location:

a. Adjacent to the reading room with easy access from the office-workroom.

b. Convenient access to the charge-out desk to permit qualified staff to assist pupils in location of periodicals and books.

433.033 Activities: Storage of certain books and back issues of periodicals.

433.034 Equipment and facilities:

a. Maximum, adjustable shelving, open and closed, of appropriate height, width, and depth.

433.04 Instructional aids storage: (Optional. May be combined with the storage room.)

433.041 Size: One hundred to 200 square feet.

433.042 Location: Convenient access from the charging area and direct access to the building corridor.

433.043 Activities: Storage of one or more motion picture projectors on movable carts, combination slide and filmstrip projectors, overhead projectors, portable record players, tape recorders, teaching aids, etc. Simple maintenance and repairs on projectors and other equipment will be done in this room. It will also serve as a center for equipment operators, who will receive assignments and take equipment to designated rooms.

433.044 Equipment and facilities:

a. Small tackboard.

b. Small projection screen on appropriate wall.

c. Cabinet space for temporary storage of filmstrips, slides, tapes, and records used in a day's operation.

d. Work counter equipped with a small vise.

e. Electrical outlets on available wall space, including above counter.

f. Acoustical treatment and forced ventilation are essential.

g. Provide wide door with flush threshold to corridor.

Chapter 5

SCHOOL PLANT SAFETY

School officials have no greater responsibility to their communities than to provide and maintain school plants that will assure every reasonable safeguard to the life and health of persons who enter the premises or use of the facilities connected therewith.

500 *References: Guide*—pp. 153-169.

501 *Structural Safety:*

501.01 The structural-design elements shall provide:

- a. The ability of the building to resist lateral forces, such as are imposed by extreme winds and earthquakes.
- b. The ability of the building to resist distortion and rapid deterioration from excessive or uneven foundation settling or the overstress of structural members and inadequate tying.
- c. The ability of the building to carry the maximum live loads imposed on it by school and community use.

501.02 Adequate checking of these highly technical matters in school plans and specifications is usually beyond the capacity of state reviewing agencies.

501.03 The responsibility for structural and architectural design rests with the architect and structural engineer, who should be willing to sign a statement to the effect that the building plans and specifications are structurally sound and that the building was actually constructed in accordance with the approved plans.

502 *Fire Resistance:*

502.01 One-story buildings may be constructed of any type suitable materials if adequate exit facilities are available, and "hot spots" such as furnace rooms are sufficiently isolated.

502.02 Two-story buildings shall provide acceptable pupil protection against fire hazards with fire-resistive exterior walls, corridors, stairs, and adequate exit facilities.

502.03 Three or more story buildings shall be fire-resistive construction throughout.

503 *Fire Protection:*

503.01 Fire safety in school plants involves among other things: fire-safe construction, adequate exits and rapid evacuation facilities, fire stops, facilities for fire extinquishment, and the insulation of "hot spot" areas.

503.02 Refer to pages 155 through 162 of the *Guide* and appropriate sections of the ***Building Exits Code, Number 101,*** **1961, National Fire Protection Association. Where conflict exists between the** two publications, the latter takes precedence.

503.03 Heating Plant:

a. The furnace room shall be isolated from pupil-occupied areas by location and/or treatment.

b. Heat plant installations shall be in accordance with appropriate state and local Codes.

503.04 Electric Services:

a. All wiring and connections shall comply with the Underwriter's Code.

b. Refer to Section 602.

503.05 Alarms:

a. Fire alarm sending stations shall be located to permit operation when traveling natural paths of egress and also in areas having unusual fire hazards, such as shops, kitchen, heat plant, etc.

b. Warning signals must be audible in all areas of the school plant regardless of other noises and activities.

c. Strident or panic-producing signals shall be avoided particularly in assembly areas where panic hazards are excessive.

d. Refer to Section 605.

503.06 Extinguishers:

a. Fire extinguishers shall be installed according to type, capacity, location, and hazard involved consistent with recommendations of the National Board of Fire Underwriters.

b. Corridor extinguishers should be set or hung in recesses at locations so that each point in the corridor is within 100 feet of an extinguisher.

504 *Circulation, Safety, and Convenience:*

504.01 The educational service value of a school plant may be improved by carefully planning traffic circulation. The principle objectives in planning for safe, convenient circulation include:

a. Safe facilities under all conditions for mass or emergency evacuation.

b. Minimum travel distances for all building occupants in accomplishing the day's work.

c. Minimizing traffic congestion and interference.

d. Reduction of disturbance of classwork because of student traffic.

e. Ease of supervision of student traffic.
f. Desirable segregation of student groups.
g. Easy circulation between building and contemplated future extensions.

504.02 Corridors:

a. The absolute minimum clear passageway of any corridor in a school building shall be six feet and in most instances corridors should be wider. Room and locker doors swinging into corridors shall not at any point of the swing reduce the minimum clear passage.
b. A means of egress shall exist at each end of a corridor, and in no case shall any corridor extend more than 20 feet beyond a means of exit.
c. Doors separating corridors from stair enclosures shall be self-closing type, swing in direction of exit, and contain clear wire-core glazing.
d. Doors opening into stairway enclosures shall not swing across or into required line of travel.

504.03 Stairways:

a. Buildings of more than one story shall have at least two main stairways remote from each other, providing a continuous path of exit travel to the outside.
b. Preferably, stairways should not be located in corridors, but should run at right angles to the corridors.
c. Stairways shall be enclosed with fire-resistive materials consistent with materials used in the general construction of the building.
d. Stairways shall permit at least two lanes of traffic by providing minimum width of 44 inches, clear of all obstructions.
e. Stairways shall have a minimum of three risers, a maximum of 16 risers to the run, and landings between runs with clear width equal to that of the stairway.
f. Risers for main stairways should not exceed six and one-half inches; treads, exclusive of nosing and overhang, and should not be less than ten and one-half inches in width.
    (1) The nosings of all treads and stairway landings shall be constructed and maintained so as to provide non-slip surfaces.
g. Handrails rigidly attached on both sides of the stairway should be 26 to 30 inches above nosing, depending upon age of the pupils.
h. Closets or storage spaces shall not open into stairway enclosures nor shall such space be permitted under or over stairways.

504.04 Exits:

a. All buildings, including one-room buildings, shall have at least two means of exit remote from each other.

b. In buildings more than one story in height, first floor exit doors shall be provided in accordance with the following:

   (1) One unit of door width for each unit of required stairs from upper floors;

   (2) Plus one additional unit of door width for each unit of required stairs from basement;

   (3) Plus one additional unit of door width for each 4,000 square feet or fraction thereof of gross area of first floor;

   (4) Plus one additional unit for each 600 square feet or fraction thereof of floor area of auditorium, gymnasiums, or assembly rooms.

c. When double exterior doors are used, a center mullion shall be provided. At least one such exit shall have a removable mullion to permit passage of large objects.

d. The unit width of doorways is 22 inches. The minimum width of any single exit doorway shall be 36 inches, which will be counted as one and one-half units of width.

e. Exits and stairs shall be located so that at least one means of egress will be within approximately 100 feet of every classroom doorway.

f. Exterior doors shall be fitted with antipanic hardware, checks, stops, and closers. (Exception: classroom doors leading directly out-of-doors.)

g. Classroom doors shall open with the line of traffic and shall be fitted with hardware which cannot be locked against egress.

504.05 Signs:

a. All auditoriums, assembly areas, gymnasiums, stairways, corridors, and exits should have illuminated signs with "EXIT" in plain, legible letters with direction arrow, if necessary.

505 *Other Circulation and Traffic Problems Which Need Special Attention:*

505.01 The plan of the drive and bus-loading platform should be such that all buses can line up in tandem, permitting children to enter the bus from the right; that is, without crossing either in front or to the rear of the buses.

505.02 At the elementary schools, access to the school grounds should be such that pupils coming to the site do not need to walk through any part of the building to get to the playground.

408.033 Location:
- a. Convenient access from other music rooms.
- b. Access to instrumental storage without passing through studio.
- c. Convenient access from building to corridor.
- d. Permit ease of supervision.

408.034 Activities: Vocal and instrumental practice and small group instruction.

408.035 Equipment and facilities:
- a. Chalkboard: Sixteen to 20 linear feet; tackboard as much as possible.
- b. Glazed partition for ease of supervision.
- c. Acoustical treatment.
- d. Independent, forced ventilation.
- e. Piano and bench.
- f. Folding chairs with folding tablet arms.
- g. Music stands.

408.04 Instructors' office and library: (May be separate rooms or combination).

408.041 Size: Area as needed, minimum 250 square feet.

408.042 Capacity: Two instructors and several pupils.

408.043 Location:
- a. Direct or convenient access to other music rooms.
- b. Permit ease of supervision of studio and auxiliary rooms.

408.044 Equipment and facilities:
- a. Instructors' desks and chairs.
- b. Three to four four-drawer, legal size filing cabinets.
- c. Storage for instructors' personal belongings.
- d. Six to eight linear feet, each, of chalkboard and tackboard.
- e. Conference table and chairs.
- f. Storage for printed music and other instructional aids:
  - (1) Fifteen to 20 linear feet of open shelving.
  - (2) Thirty to 40 linear feet of closed shelving.

408.05 Instrument storage:

408.051 Size: Area as needed, minimum 200 square feet.

408.052 Provide storage shelving necessary to accommodate instruments of various sizes.

408.06 Robe and uniform storage: may be in portable wardrobes or separate rooms; area and ventilation as needed.

409 *Physical Education:* Factors influencing location include: Isolation from quiet areas of the building; direct access to the outside; provision for closing off area for after-school use.

NOTE: Although less desirable, these facilities are frequently combined with assembly facilities.

409.01 Gymnasium:

409.011 Size: Determination of size is dependent upon court dimensions, spectator seating and auxiliary physical education spaces to be located adjacent to the main playing floor. The use of the roll-a-way bleachers will permit the physical education use of the area normally devoted to seating.

a. Playing floor: 42′ x 74′—junior high school; 50′ x 84′—high school; four-foot safety zones on each side, and eight-foot safety zones on each end. Floor area should be marked for various games.

409.012 Capacity: Maximum, two groups of 50 pupils for physical education.

409.013 Location:

a. Convenient access from locker and shower rooms.
b. Direct access to lobby which may also serve the auditorium and as student commons.

409.014 Activities: Various physical education activities for individuals and groups; athletics; noon recreational programs; social affairs and parties involving school groups.

409.015 Equipment and facilities:

a. Provisions for using the gymnasium as two or more teaching stations may require canvas-net partition, fold-door partition, or mechanical folding wall.
b. Roll-a-way bleachers, capacity to be determined.
c. Eyebolts or similar devices, 10 to 12 feet, above floor at 10-foot intervals to secure nets and decorations.
d. Mat hangers and mats at each end of the basketball court.
e. Apparatus and equipment such as: flying rings, traveling rings, climbing ropes, overhead ladder, chinning bars, jumping standards, canvas mats, etc.
f. Electric scoreboard and control station.
g. Electrical outlets for scoreboard, record player, auxiliary lighting, and cleaning equipment. Additional special outlets may be needed for public-address system and broadcasting facilities.

h. Basketball baskets.
i. Forced ventilation.

409.02 Lobby:

409.021 Size: Area as needed to accommodate anticipated crowds and students using the area during the school day.

409.022 Location:

a. Convenient access from the parking area.
b. Convenient access from major instructional areas.
c. Direct access to concession stand.
d. Direct or convenient access to public toilets.

409.023 Activities: Congregation and dispersal of crowds; viewing displays; socializing; and purchase of tickets.

409.024 Equipment and facilities:

a. Display facilities:
   (1) Two or three small cases for display purposes.
   (2) Twelve to 16 linear feet of tackboard.
b. Public telephone.
c. Drinking fountains.
d. Comfortable, low-wall seating.
e. Lounge furniture.

409.03 Ticket office(s):

409.031 Size: Twelve to 15 square feet, each.

409.032 Location:

a. Direct access to lobby.
b. Located so that:
   (1) Lines can form inside the building.
   (2) Lines do not block traffic.

409.033 Equipment and facilities:

a. Counter with one or two window openings.
b. Adjustable stools.
c. Adequate control of heat and ventilation.

409.04 Concession stand:

409.041 Size: Dependent upon refreshments to be served and anticipated crowds being served.

409.042 Location:

a. Direct access to lobby.
b. Removed from lounge area and ticket offices.

409.043 Activities: Cooling beverages; preparing hot beverages; making popcorn; preparing hot dogs; displaying and selling merchandise.

409.044 Equipment and facilities:
- a. Work counter.
- b. Maximum serving counter.
- c. Storage for equipment, supplies, and refreshments.
- d. Sink with hot and cold water.
- e. Hot plate.
- f. Electrical outlets.
- g. Floor drain.

409.05 Gymnasium equipment storage: (At least two)

409.051 Size: Area as needed, minimum 150 square feet.

409.052 Location: Directly accessible to each teaching station when gymnasium is divided into two teaching stations.

409.053 Equipment and facilities:
- a. Open storage area for items such as standards, vaulting horses, horizontal bars, etc.
- b. Enclosed storage cupboards for small items of physical education equipment.
- c. Double doors and flush threshold.

409.06 General storage:

409.061 Size: Minimum, 100 square feet.

409.062 Location: Direct or convenient access to gymnasium.

409.063 Equipment and facilities:
- a. Open storage for piano, record players, portable public-address system.
- b. Closed storage cabinets for small items of equipment.

409.07 Boys' and girls' dressing-locker rooms:

409.071 Size: Dependent upon manner in which gym clothing, street clothing, towel distribution, etc., are handled and the number of pupils expected to use this facility. Minimum, 750 square feet.

409.072 Capacity: Approximately 50 students.

409.073 Location:
- a. Direct or convenient access to gymnasium.
- b. Direct access to outside physical education areas.
- c. Direct access to building corridor.
- d. Direct access to body-drying room.
- e. Permit ease of supervision.
- f. Convenient access to auditorium-stage.

409.074 Activities: Dressing for physical education and stage productions; storing street and gym clothes; informal talks with physical education instructors or coaches.

409.075 Equipment and facilities:

a. Street clothes lockers dispersed among gym clothes lockers.
b. Space for additional lockers.
c. Benches adjacent to or between rows of lockers.
d. Small toilet room or partitioned area with water closet, lavatory, (and urinal).
e. Forced ventilation.
f. Mirrors to accommodate large numbers of pupils, shelving under each mirror and one full-length mirror.
g. Four to eight linear feet of tackboard near entrance.
h. Six linear feet of chalkboard.
i. Drinking fountain and cuspidor.

409.08 Boys' and girls' shower rooms:

409.081 Size: minimum, approximately 200 square feet.

409.082 Location: Access to locker-dressing room only through the body-drying room.

409.083 Equipment and facilities:

a. Twelve to sixteen gang showers.
b. Master volume and maximum temperature controls.
c. Individual temperature and on-and-off controls.
d. Bar-soap trays.
e. Forced ventilation.
f. Warm floors.
g. Floor drains away from normal traffic.
h. Hose bibb for hot and cold water.

NOTE: Individual dressing, drying, and showering booths may be provided in girls' shower area. The number should not exceed three or four.

409.09 Boys' and Girls' body-drying rooms:

409.091 Size: Minimum, approximately 100 square feet.

409.092 Location:

a. Direct access from locker-dressing and shower rooms; entries to require maximum travel distance through drying room.
b. Direct, or convenient access from varsity locker-dressing room (boys' facility).

409.093 Equipment and facilities:
- a. Stubb towel holders.
- b. Floor drains away from center.
- c. Forced ventilation.
- d. Warm floors.
- e. Hose bibb for hot and cold water.

409.10 Towel Room: (Optional)

409.101 Size: Fifty to 60 square feet.

409.102 Location:
- a. Convenient to the locker-dressing and shower areas.
- b. Permit ease of supervision from locker-dressing area and instructor's office.

409.103 Activities: Distribute clean towels to pupils and receive used towels from pupils; provide temporary storage for clean towels.

409.104 Equipment and facilities:
- a. Shelving to accommodate laundered towels.
- b. Movable laundry carts to accommodate used towels.
- c. Dutch-door for issuing and receiving towels.

409.11 Laundry area: (Optional).

409.111 Size: As needed.

409.112 Location: Convenient to physical education and athletic locker-dressing areas.

409.113 Activities: Launder and dry gym clothing, athletic suits, etc.

409.114 Equipment and facilities:
- a. Washing machine
- b. Dryer.
- c. Work surface to prepare clothing and equipment for laundering.

409.12 Instructors' office:

409.121 Size: Minimum, 100 square feet.

409.122 Location:
- a. Direct access to locker-dressing room.
- b. Direct or convenient access to gymnasium and outdoor physical education areas.
- c. Permit ease of supervision of locker-dressing room.

409.123 Activities: Instructors' showering and dressing; conferences; administering first aid.

409.124 Equipment and facilities:
- a. Toilet, lavatory, and shower.
- b. Desk and chair.
- c. Conference chairs.
- d. Four-drawer filing space.
- e. Storage of personal belongings.
- f. Ten to 15 linear feet of book shelving.
- g. First-aid equipment.
- h. Telephone.

409.13 Athletic equipment storage room:

409.131 Size: Dependent upon materials, supplies, and equipment to be stored. Minimum, approximately 300 square feet.

409.132 Location: Direct access to varsity dressing-locker room, if provided; otherwise, to the boys' dressing-locker room.

409.133 Equipment and facilities:
- a. Bins for storing helmets.
- b. Shelves for storing jerseys, sweat shirts and pants, shoulder pads, hip pads, warm-up suits, etc.
- c. Cupboards for storage of small items.
- d. Work-bench with vise.
- e. Dutch-door for issuing equipment.

409.14 Varsity locker-dressing room: (Optional)

409.141 Size: Minimum, 750 square feet.

409.142 Capacity: Approximately 50 pupils.

409.143 Location:
- a. Direct access to the equipment room.
- b. Direct or convenient access to boys' or girls' body-drying and shower rooms with provisions for locking these entries during the school day.
- c. Convenient access to the gymnasium.
- d. Direct access to out-of-doors physical education areas.

409.144 Equipment and facilities:
- a. Lockers.
- b. Benches between rows of lockers.
- c. Forced ventilation.
- d. Separate toilet room or partitioned area with water closet, urinal and lavatory.
- e. Mirrors at convenient locations with shelves under mirrors.
- f. Four to eight linear feet of tackboard near entrance and a similar amount of chalkboard.

410 *Science Facilities:* Items to be considered in locating these facilities are: Ease of access to outdoor science areas; ease of delivery of supplies and materials; isolation so odors cannot infiltrate the remainder of the building. Facilities may be designed for instruction in single disciplines or in combinations, such as physics-biology, physics-general science, chemistry-biology, etc.

410.01 Combination chemistry-physics lecture-laboratory:

410.011 Size: Base preliminary determination of area on allotment of 35 to 45 square feet per pupil; minimum, 1200 square feet; exclusive of separate storage.

410.012 Capacity: 28 students.

410.013 Location:

- a. Direct access to storage and project-preparation rooms.
- b. Convenient access to other science classroom-laboratories.

410.014 Activities: Instruction and demonstration; class-size and small group discussion; viewing of films, slides, and other projected materials; individual study and research; individual and small group experimentation; and storing of equipment and materials.

410.015 Equipment and facilities:

- a. Chalkboard; chart and display rail above:
  - (1) Twenty-five to 35 linear feet.
  - (2) Minimum of 40 inches clear height.
  - (3) Major portion on front wall.
- b. Tackboard: Ten to 16 linear feet; chart and display rail above.
- c. Thirty linear feet of adjustable shelving.
- d. Conference table and chairs.
- e. Ventilated (portable or fixed) fume hood.
  - (1) Equip with water, gas, compressed air, and AC and DC electricity.
  - (2) Wide enough for two pupils.
  - (3) Easily visible from demonstration area if fixed piece of equipment.
- f. Instructor's demonstration table, including sink, hot and cold water; gas; and AC and DC electricity; compressed air and vacuum, if desired.
- g. Laboratory work space two and one-half linear feet per student (may be provided as tables or work-counters):
  - (1) Equip with sink, water, gas, AC and DC electricity flush plates, and support rods.
  - (2) Individual pupil storage units.

   (3) Corrosive resistant work surface and plumbing.
   (4) Perimeter location, preferred; project from the wall.
- h. Open shelving for often-used chemicals and other materials.
- i. Fire extinguisher and blanket.
- j. Five to six balance cases.
- k. Tablet-arm chairs or two-pupil work tables and chairs.
- l. Teacher's desk and chair.
- m. Facilities for darkening the room.

410.02 Chemistry storage:

410.021 Size: Minimum, 100 square feet.

410.022 Location.
- a. Direct access from preparation-project room.
- b. Convenient access from classroom-laboratories.

410.023 Equipment and facilities:
- a. Maximum amount of adjustable shelving, varied height and depth.
- b. Positive, independent ventilation.

410.03 Physics storage room:

410.031 Size: Minimum, 100 square feet.

410.032 Location:
- a. Direct access from preparation-project room.
- b. Convenient access from classroom-labortory.

410.033 Equipment and facilities:
- a. Seventy-five to 100 linear feet of varied height and depth of adjustable shelving.
- b. Maximum closed adjustable shelving.

410.04 Preparation-project room: This facility may be planned in conjunction with the chemistry and physics storage areas if proper attention is given to storage for chemistry and physics supplies and equipment and independent ventilation is maintained for chemical storage cabinet:

410.041 Size: Approximately 200 square feet; if combined with storage, 400 square feet.

410.042 Capacity: Instructor and four to six pupils.

410.043 Location:
- a. Direct access from classroom-laboratory and from building corridor.
- b. Convenient access from other science facilities located in adjacent portions of the science suite.
- c. Permit ease of supervision from classroom-laboratories.

410.044 Activities: Preparation for demonstrations; storage of projects; individual and small group project work.

410.045 Equipment and facilities:
a. Maximum work-counter space with minimum of two sinks.
b. Storage units above and below work-counter.
c. Water, gas, vacuum, compressed air, and AC and DC electricity at work-counter.

410.05 Darkroom:

410.051 Size: Minimum, 100 square feet.

410.052 Capacity: Three to four pupils and an instructor.

410.053 Location:
a. Direct access from classroom-laboratory.
b. Convenient access to corridor without passage through classroom-laboratory.

410.054 Equipment and facilities:
a. Laboratory work-counter.
  (1) Acid-resistant sink, large enough to accommodate three pans.
  (2) Storage below.
  (3) Gas, electricity, and hot and cold water.
  (4) Safe lights.
b. Storage cabinet for photography equipment and materials.
c. Warning light with switch near door.
d. Adequate ventilation.

410.06 Biology and general science classroom-laboratory:

410.061 Size: Base preliminary determination of area on allotment of 30 to 40 square feet per pupil; minimum, 900 square feet, exclusive of separate storage room.

410.062 Capacity: 30 pupils.

410.063 Location:
a. Direct access to preparation-project room.
b. Direct or convenient access to storage and growing room.
c. Convenient access to other rooms in the science suite.

410.064 Activities: Instruction and demonstrations; class-size and small group discussion; individual and small group experimentation; viewing slides, films, and other projected materials; write or draw at tables and chalkboards; individual study and research; display of pupil projects.

410.065 Equipment and facilities:

- a. Chalkboard; chart and display rail above:
    - (1) Twenty to 30 linear feet.
    - (2) Minimum, 40 inches clear height.
    - (3) Major portion on front wall.
- b. Ten to 12 linear feet of tackboard; chart and display rail above.
- c. Work-counter.
    - (1) Forty to 50 linear feet.
    - (2) Three to four acid-resistant sinks with hot and cold water.
    - (3) Impervious work surface.
    - (4) Gas and electricity.
    - (5) Storage under work-counter.
    - (6) Movable aquariums and terrariums.
- d. Thirty to 40 linear feet closed shelving, 18 inches deep.
- e. Fifteen to 20 linear feet of open shelving.
- f. Instructor's demonstration table including sink, hot and cold water; gas; and electricity.
- g. Two-pupil tables and chairs or combination desk-chairs that could be used as work surfaces.
- h. Teacher's desk and chair.
- i. Facilities for darkening room.
- j. Fire extinguisher and blanket.

410.07 Biology and general science storage:

410.071 Size: Minimum, 200 square feet.

410.072 Location:

- a. Direct access from preparation-project room.
- b. Direct or convenient access from classroom-laboratory and growing room.

410.073 Equipment and facilities:

- a. Maximum varied height and depth adjustable shelving.
- b. Positive ventilation.

410.08 Preparation-project room—May be planned as combination with storage area:

410.081 Size: Minimum, 200 square feet.

410.082 Capacity: Instructor and four to six pupils.

410.083 Location:

- a. Direct access from classroom-laboratory and from building corridor.

b. Convenient access from other science facilities located in adjacent portions of the science suite.
c. Permit ease of supervision from classroom-laboratory.

410.084 Activities: Preparation for demonstrations; storage of projects; individual and small group project work.

410.085 Equipment and facilities:
a. Maximum work-counter space with minimum of two sinks.
b. Storage units above and below work-counter.
c. Water, gas, vacuum, compressed air, and AC and DC electricity at work-counter.

410.09 Growing room: (Optional)

410.091 Size: 100 square feet.

410.092 Location:
a. Direct access to classroom-laboratory.
b. Adequate control of sunlight and artificial illumination for plant growing experiments.

410.093 Activities: Germination of seeds; growth and care of plants and animals; individual and small group-controlled experiments.

410.094 Equipment and facilities:
a. Adequate ventilation and independent heat control.
b. Moisture-resistant floor and work surfaces.
c. Floor drain.
d. Hose bibb.
e. Three to four moisture-proof electrical outlets.
f. Six linear feet of work-counter.
g. Separate service sink with plaster trap, adjacent to counter.
h. Plant beds and animal cages.

411 *Vocational Agriculture Facilities:* Factors influencing the location of the facilities include: Isolation from quiet areas of the building; location to provide easy delivery of instructional supplies, materials and equipment including farm machinery; location convenient to industrial arts or other vocational areas; and location which permits isolation from remainder of the building for after-school use.

411.01 Classroom:

411.011 Size: Base preliminary determination of area upon allotment of 30 to 35 square feet per pupil. To more accurately determine area, trial room layouts should be made using scale templates representing furniture and equipment with scale drawings of floor and wall elevations.

411.012 Capacity: 24 pupils.

411.013 Location:

- a. Convenient or direct access to shop and office.
- b. Ground floor, convenient to a building entrance.
- c. Permit maximum, controlled natural light.

411.014 Activities: Lecture; discussion; view slides, films, and other projected materials; write or draw on chalkboard and tables; display pupils' work; store instructional materials and supplies.

411.015 Equipment and facilities:

- a. Chalkboard: Twenty to 24 linear feet; display and chart rail above.
- b. Tackboard: As much as possible; minimum, four linear feet; height four feet; display and chart rail above. Locate one section adjacent to entrance.
- c. Two-pupil tables and chairs.
- d. Teacher's desk and chair.
- e. Demonstration table.
- f. Storage:
  - (1) Legal size, four-drawer file cabinet.
  - (2) Magazine rack.
  - (3) Minimum of 40 linear feet of adjustable shelving.
  - (4) Record book holder.
- g. Duplex electrical outlets on all walls, if possible.
- h. Facilities for light control to permit use of visual aids.

411.02 Agriculture mechanics shop:

411.021 Size: Base preliminary determination of area on allotment of 75 to 125 square feet per pupil. To more accurately determine area, trial room layouts should be made using scale templates representing furniture and equipment with scale drawings of floor and wall elevation.

NOTE: The assistance of specialists in vocational argriculture should be secured in planning these facilities.

411.022 Capacity: 24 pupils.

411.023 Location:

- a. Convenient access to classroom and instructor's office.
- b. Direct access to service drive.

411.024 Activities: Construct farm equipment; repair farm machinery; weld; finish and paint equipment; operate power equipment; store tools, raw materials, partially completed projects, etc.

411.025 Equipment and facilities:
- a. Varies with program offered in shop.
- b. Chalkboard and tackboard: Four to six linear feet, each.
- c. Window sills should be high enough to permit installation of equipment along wall.
- d. Floor or ceiling electrical grid system for 110 and 220 power to various machines with master control switches.
- e. Overhead door to service drive.
- f. Storage for consumable raw materials and supplies may be provided in separate storage room or in cabinets and racks within shop. Area required equivalent to storage room of 100 to 300 square feet.
- g. Fire extinguisher.

411.03 Instructor's office:

411.031 Size: 100 to 125 square feet.

411.032 Location: Convenient or direct access to shop and classroom.

411.033 Equipment and facilities:
- a. Teacher's desk and chair.
- b. One or two conference chairs.
- c. Storage:
  - (1) Letter-size four-drawer file cabinet.
  - (2) Fifteen to 20 linear feet of open and closed shelving.
- d. Minimum of two duplex electrical outlets.

411.04 Storage room:

411.041 Size: Seventy-five to 150 square feet.

411.042 Location:
- a. Convenient or direct access to the classrooms.
- b. Direct access to the office.

411.043 Activties: Storage of instructional supplies, equipment, materials, and visual aids.

411.044 Equipment and facilities: Adjustable shelving of various height and depth.

430 *Administration and Special Service Facilities:* Factors influencing the location of the administrative facilities include: Proximity to the main entrance of the school, convenient access to the instructional areas of the building, seclusion from outside noises, and convenient access to the special service facilities. As these facilities may be used during the summer months, air conditioning should be considered.

430.01 General office and waiting room:

430.011 Size: Dependent upon initial enrollment and ultimate enrollment of the school; 400 to 600 square feet will likely be needed for secretarial and waiting areas.

430.012 Location:

a. At the hub of the administrative suite.
b. Direct access to a building corridor and to work room.
c. Direct or convenient access to offices of the principal, assistant principal, and other rooms in the administrative suite.
d. Location should provide convenient access to the special service facilities.

430.013 Activities: Reception of school visitors, pupils, and staff; general secretarial activities required in the operation of the school.

430.014 Equipment and facilities:

a. Counter separating reception-waiting area from the secretarial work area.
b. Comfortable chairs in reception area.
c. Small table for magazines and other literature.
d. Four to six linear feet of tackboard in waiting area.
e. Mail boxes for faculty members, located for easy access without interference with main office traffic.
f. Secretatrial desks and chairs.
g. Work table.
h. Legal size filing cabinets in secretarial area.
i. Master telephone station or other communication system at secretarial position to control communications to all positions in the administrative and special service areas.

430.02 Principal's office:

430.021 Size: One hundred twenty-five to 150 square feet.

430.022 Location:

a. Direct or convenient access to general office.
b. Convenient access to the corridor without going through the general office.

430.023 Activities: Planning, research, and administrative activities conducted individually or in small groups.

430.024 Equipment and facilities:
- a. Room design should permit the principal to confer without being overheard in adjacent areas.
- b. Conference desk and chair.
- c. Work table convenient to desk for layout work.
- d. Conference chairs.
- e. Ten to 15 linear feet of bookshelving.
- f. Storage for personal belongings.
- g. Telephone service and call system to secretary in general office.

430.03 Assistant principal's office:

430.031 Size: One hundred to 125 square feet.

430.032 Location: Convenient access to general office and principal's office.

430.033 Activities: Planning, research, and administrative activities conducted individually or in small groups.

430.034 Equipment and facilities:
- a. Room design should permit the assistant principal to confer without being overheard in adjacent areas.
- b. Conference desk and chair.
- c. Work table convenient to desk for layout work.
- d. Conference chairs.
- e. Ten to 15 linear feet of bookshelving.
- f. Storage for personal belongings.
- g. Telephone service and call system to secretary in general office.

430.04 General office-teachers' work room:

430.041 Size: One hundred fifty to 250 square feet.

430.042 Location: Direct access to the general office and waiting room.

430.043 Activities: Preparation of testing materials, reports, and layouts of instructional materials by both secretarial and teaching personnel.

430.044 Equipment and facilities:
- a. Combination of open shelving and closed cabinets for storage of a variety of supplies and equipment.
- b. Duplicating machine.
- c. Typewriters.
- d. Calculator.
- e. Work table or counter for layout work.
- f. Lavatory with hot and cold water.

430.05 Supply and book storage room:

430.051 Size: Three hundred to 400 square feet.

430.052 Location:

- a. Convenient access to the general office.
- b. Direct opening to corridor through "dutch-door" or window to permit distribution of books and supplies.

430.053 Activities: Storage and distribution of instructional materials and supplies including books, paper, notebooks, erasers, pencils, etc.

430.054 Equipment and facilities:

- a. Cabinets and shelving for books and other school supplies and materials.
- b. Desk and chair.
- c. Work counter or table space.
- d. Filing space.
- e. (Optional) Small wall safe for temporary storage of small sums of money and other valuables.

430.06 Record Vault (Optional):

NOTE: This facility may be eliminated by providing fire-resistant filing cabinets in the general office or other storage area.

430.061 Size: Fifty to 75 square feet.

430.062 Location:

- a. Direct or convenient access from the general office.
- b. Direct or convenient access to guidance and health area.

430.063 Activities: Storage of current and former pupil records.

430.064 Equipment and facilities:

- a. General construction should be fire-resistant.
- b. Movable cart storage units, preferable for current records of pupils enrolled in school.
- c. Storage for permanent records of former pupils, may be in filing cabinets or in other suitable filing devices.

430.07 Conference room:

430.071 Size: Two hundred to 300 square feet.

430.072 Location:

- a. Convenient access to general office, principals' offices, counselors' offices, and the public-address system control room.
- b. Design and location should permit groups to confer without being overheard in adjacent rooms.

430.073 Activities: Conferences involving five to 12 people and program broadcasts to instructional areas.

430.074 Equipment and facilities:
- a. Conference table and chairs.
- b. Six to eight linear feet of chalkboard.
- c. Four to six linear feet of tackboard.
- d. Glazed panel between conference area and public-address system control room.
- e. Forced ventilation.

430.08 Public-address system control room:

430.081 Size: Seventy-five to 100 square feet.

430.082 Location:
- a. Adjacent to conference room.
- b. Convenient access to general and principals' offices.

430.083 Activities: The distribution of information and educational programs within the school.

430.084 Equipment and facilities:
- a. Common partition between this room and the conference room should be glazed. Equip with draperies for isolation of conference room when used for other purposes.
- b. Adequate sound and electrical outlets in conference and control room.
- c. Public-address control system panel with orientation toward conference room.
- d. Storage facilities for audio supplies and equipment such as records, tape recordings, sound effects, microphone stands, and similar equipment.

NOTE: *The following facilities should be closely related to the administrative facilities for internal communication purposes, such as sharing pupil records and using of conference room facilities; however, separate entrances and waiting areas may be provided.*

430.09 Counselors' offices:

430.091 Size: One hundred to 125 square feet.

430.092 Location:
- a. Direct access from waiting area and convenient access to conference room and general office in the administrative suite.
- b. Design and location should permit conferences without voices being overheard in the adjacent areas.

430.093 Activities: Individual and group guidance, counseling, and conferences with pupils, parents, and teachers.

430.094 Equipment and facilities:
- a. Desk and chair.
- b. Conference chairs.

c. Ten to 15 linear feet of shelving.
d. Four to six linear feet of tackboard.
e. Storage for personal belongings.
f. Telephone communications with general office and call system to secretary.

430.10 Health Service Unit:

430.101 Size: Three hundred to 400 square feet.

430.102 Location: Direct access from waiting area and from building corridor to permit traffic to pass through the area for various screening tests.

430.103 Activities: Examinations by nurses, doctors, dental hygienists, etc.; administration of first aid.

430.104 Equipment and facilities:
a. Small room or curtained area for each sex, to permit rest and isolation in case of sickness.
b. Tackboard.
c. Toilet and lavatory with hot and cold water.
d. Scales, medicine chest, sterilizer, etc.
e. Storage for bed linens.
f. Storage closet for nurses' personal belongings.

430.11 Waiting room: (Optional)

430.111 Size: One hundred to 150 square feet.

430.112 Location: Direct access to counselor offices and health unit.

430.113 Activities: Reception of and browsing by pupils and parents.

430.114 Equipment and facilities:
a. Secretarial desk and chair.
b. Typewriter and typewriter stand.
c. Comfortable chairs.
d. Book and magazine shelving for variety of occupational information and college bulletins.
e. Filing cabinet for occupational information not displayed on racks.

430.12 Teachers' lounge:

430.121 Size: Two hundred to 300 square feet.

430.122 Location:
a. Direct access from a building corridor.
b. Convenient access to staff toilets.

c. Location avoiding major pupil traffic, yet reasonably close to the administrative area.

d. Toilets should not have direct opening into the lounge area.

430.123 Equipment and facilities:

a. Comfortable lounge furniture.

b. Kitchenette to prepare light refreshments (optional).

c. Adequate ventilation.

430.13 Staff toilets (one for each sex):

430.131 Size: Fifty to 75 square feet, each.

430.132 Location:

a. Near an administrative and special-service areas, convenient to teachers' lounge, but direct access from a building corridor.

431 *Auditorium:* Factors influencing the location of the auditorium include: Ground level position easily shut off from other areas of the building, convenient access to language arts classrooms, convenient access to physical education dressing-locker rooms to permit use as stage-dressing rooms, convenient access to service drive for the delivery of bulky properties, location so that community groups may use facility during the school day without interferring with school activities, and location which permits planned multiple use of lobby area, and convenient access to public parking facilities. Consider accessibility of pupil toilets for public use and classrooms for coat check areas during use in after-school hours.

NOTE: Although less desirable these facilities are frequently combined with physical education facilities.

431.01 Body of auditorium:

431.011 Size: Dependent upon ultimate seating capacity desired and singular or multiple use of the facility. Approximately six square feet will be needed for each seat provided.

431.012 Capacity: Dependent upon desire to seat entire student enrollment or portion of the student enrollment at one time.

431.013 Activities:

a. Production and performance of various student plays, operettas, variety shows, etc.

b. Performances before student audiences by visiting groups or individuals contributing to the educational program of the school.

c. Multiple use of the area for instructional purposes—large and small group instruction etc.

431.014 Equipment and facilities:

a. Space in front of the auditorium for orchestra, band, and other activities.

b. Acoustical qualities so that weak voices of some platform participants may be heard throughout the auditorium.

c. Facilities whereby programs originating in the auditorium may be broadcast throughout the school.

d. Sound amplification controls should be located in projection niche or booth.

e. Convenience lights arranged and located for partial illumination during performances.

f. Light control by multi-way switches convenient to entrances, near stairs to the stage and projection booth.

g. Convenience and pilot light circuits should be tied into main light-control panel for control during productions.

h. Duplex electrical outlets, appropriate in number, should be provided:

  (1) Along front of stage apron.

  (2) At rear of the body of the auditorium.

  (3) About one-third the distance from the stage to the rear of the auditorium for use with various audio-visual projectors.

i. Projection niche (optional) at the rear of the room for use of 16 mm film projector.

j. Speakers for use with projector located in the rear of the seating area.

431.02 Lobby:

431.021 Size: Area as needed to handle anticipated crowds.

431.022 Location: To serve as common lobby for auditorium and gymnasium if facilities are provided in separate units, or may be used as common lobby with other public service areas.

431.023 Activities: In addition to serving as a gathering area for large groups attending affairs in the auditorium and/or gymnasium, this facility may also serve as a student commons.

431.024 Equipment and facilities:

a. See description, No. 409.02.

431.03 Stage:

431.031 Size: Fourteen hundred to 1600 square feet.

431.032 Location:

a. Provide ample wing space on each side of the stage.

b. Access to the stage and building corridor without entering body or lobby of the auditorium.

431.033 Equipment and facilities:

a. Apron in front of the main curtain, approximately eight feet wide, with direct access to the body of the auditorium at each end.

b. Stage must be free of partitions.

c. Wide double doors with flush threshold opening onto the stage to permit passage of bulky properties.

d. Hardwood floor for the apron and the stage and soft wood floor for the backstage and wing areas.

e. Electrical circuits included:

   (1) Border with roundels of four different colors.

   (2) Circuits for adjustable spotlights mounted on at least two battens.

   (3) Flush floor pockets or equivalent mounted in floor behind cyclorama with at least one outlet directly behind proscenium arch on each side.

   (4) Duplex electrical outlets mounted near floor on walls of stage.
   Note: Flood lights are not needed.

   (5) Stage work lights controlled by multi-way switches at stage entrances, stairs from the body of the auditorium and tied into the light panel for positive control during productions.

f. Provide panel for controlling stage and house lights including beam and spotlights mounted in the ceiling of the auditorium.

g. Light control panel designed to avoid overloading of circuits and resulting dimmer damage; and should be flexible and expansible.

h. Means for mounting 10 to 12 foot roll-up motion picture screen.

i. Microphone outlets to the rear of the proscenium arch and two or three under the leading edge of stage apron.

431.04 Stage-crafts—workshops—storage:

431.041 Size: Three hundred to 400 square feet.

431.042 Location: Direct access to the stage wing yet arranged to prevent noise interference on the stage.

431.043 Activities: Prepare, alter, and store materials, such as stage flats and other properties, store general purpose equipment used for auditorium programs.

431.044 Facilities and equipment:

a. Double doors with flush threshold.

b. Ten linear feet of work-counter approximately 30 inches deep, with storage under.

- c. Tool cabinet.
- d. Sink with hot and cold water.
- e. Movable storage cabinets for stage properties.
- f. Electrical outlets on available wall space including area over work bench.
- g. Six linear feet of tackboard.
- h. Storage for flats of various widths, appropriate for height of the proscenium arch.
- i. Storage for grand piano, costumes, stage properties, lighting and projection equipment.

432 *Food-Service Facilities:* Items influencing location of these facilities include: Ease in delivery of supplies and equipment and disposal of wastes; isolation from other portions of the building for after-school-hour activities with or without food service; and accessible to physical education facilities so that large groups may be served.

432.01 Dining rooms:

432.011 Size: Base preliminary determination of allotment on 10 to 12 square feet per pupil seated at any one time. Provisions for subdividing large areas should be considered.

432.012 Location:

- a. Direct access from the building corridor.
- b. Convenient access from library-instructional materials center.
- c. Isolation by location and/or sound barriers from noisy areas of the building and the site.
- d. Maximum utilization of natural beauty in the vicinity.
- e. Complete separation from both food preparation and serving areas.

432.013 Activities: Dining during school and after-school hours, study, and may be considered as space for assembly or large group instruction purposes.

432.014 Equipment and facilities:

- a. A variety of tables and chairs suitable for dining as well as study purposes.
- b. Temporary storage for pupils' personal belongings convenient for pupils approaching serving lines.
- c. Electrical and microphone outlets.
- d. Double doors with flush threshold to accommodate two-way traffic.
- e. Drinking fountains in the dining area or convenient to the dining room.

f. If facilities are used for study purposes, provide space for an unabridged dictionary, abridged dictionaries, and encyclopedias; locate to permit isolation from dining room traffic during noon and after-school use.

432.02 Teachers' dining and student conference room:

432.021 Size: Two hundred fifty to 350 square feet.

432.022 Location:

a. Convenient access to serving area, building corridor, and general dining area.

432.023 Activities: Dining and meetings of teacher and staff members; committee work by pupils.

432.024 Equipment and facilities:

a. Tables and chairs suitable for dining and study purposes.
b. Eight to 10 linear feet of chalkboard.
c. Four linear feet of tackboard
d. Glazed panel between this area and the dining room to permit ease of supervision; equip with draperies to permit isolation when supervision is not necessary.

432.03 Kitchen and auxiliary facilities:

432.031 Kitchen:

a. Size: Dependent upon number of meals served during the school day, approximately two square feet per meal served, a minimum of 300 square feet.
b. Location:
    (1) Easy access to pupils in the serving line.
    (2) Direct access from the outside of building for delivery of supplies and equipment, and disposal of wastes.
    (3) To facilitate the serving of large community gatherings in this space or in the physical education area.
c. Equipment and facilities:
    (1) Small bulletin board near entrance.
    (2) Floor should be easily cleaned, nonskid material with properly located floor drains.
    (3) Wall and ceiling surfaces should be readily maintained and not affected by steam or heat.
    (4) Adequate ventilation is essential for convenience of workers and to reduce food-odor penetrations into dining area.
    (5) Adequate built-in and movable equipment for the efficient, sanitary preparation and serving of food.
    (6) Hand lavatory.

432.032 Food storage:

a. Size. Minimum one-half square foot per meal served. (See Section 607.02)).

b. Location:
   - (1) Immediate access to receiving area.
   - (2) Convenient access to food preparation area.

c. Equipment and facilities:
   - (1) Area must be dry, cool, and rodent proof throughout; therefore, heating pipes, water heaters, and compressors should not be located in this area.
   - (2) Adequate ventilation from out-of-doors.
   - (3) Maximum amount of shelving, limit height to seven feet six inches.
   - (4) Storage at floor level for large sacks of commodities on portable platforms or in covered containers on dollies.

432.033 Nonfood storage:

a. Size: Forty to 60 square feet.

b. Location: Immediate access from food preparation and storage areas.

c. Function: Provide storage of soaps, detergents, wetting agents, and other cleansing supplies and equipment required in the daily operation and maintenance of the food-service center.

d. Equipment and facilities: Custodian's service sink and a variety of shelving.

432.034 Locker-dressing room:

a. Size: Seventy-five to 100 square feet.

b. Equipment and facilities:
   - (1) Lockers.
   - (2) Mirror.
   - (3) Two or three chairs or bench.
   - (4) Toilet and lavatory.

432.035 Serving area:

a. Size: Dependent upon the number of meals to be served at any one time. Number of such areas, equally, is dependent on number of meals to be served.

b. Location:
   - (1) Provide for convenient flow of food from kitchen, dishes from dishwashing area.
   - (2) Efficient flow of pupils from serving line with minimum congestion and movement of personnel across traffic lines.
   - (3) Isolation from dining area.

c. Equipment and facilities:
   - (1) Serving counter includes tray, silverware, hot food, cold food, and milk service sections.
   - (2) Provide health guards, tray rail, menu board, and cashier's section with knee space.

432.036 Waste-disposal area:

a. Size. One hundred to 150 square feet.

b. Location: Direct or convenient access from kitchen and delivery platform.

c. Facilities and equipment:
   - (1) Space for garbage containers.
   - (2) Space for temporary storage of boxes, tin cans, etc.
   - (3) Floor drain.
   - (4) Hose bibb with hot and cold water.
   - (5) Proper ventilation and screening essential.

432.037 Receiving and office area:

a. Size: Seventy-five to 150 square feet.

b. Location: Near service entrance, yet provide for direct supervision of kitchen area.

c. Equipment and facilities:
   - (1) If separate room, provide partial glazed partition between this area and kitchen.
   - (2) Counter or table for temporary storage of certain deliveries.
   - (3) Desk, chair, and telephone service.
   - (4) Filing space.

433 *Library or Instructional Materials Center:* Factors influencing the location of this center include: Isolation from noisy areas of the building, convenient access to general purpose (academic) classrooms, and to the dining area.

433.01 Reading room:

433.011 Size: Twenty-five to 30 square feet per reader.

433.012 Capacity: Fifteen per cent of the total student body up to an enrollment of 500 and 10 per cent for an enrollment of more than 500 pupils.

433.013 Location: See factors mentioned in general comment about this center.

433.014 Activities: General reading; reference and research work with encyclopedias, books, dictionaries, maps, charts, globes, pamphlets, pictures; browsing; viewing displays; charge-out of materials; class instruction in the use of the library.

433.015 Equipment and facilities:

a. Circulation desk.
b. Tables of various sizes and shapes and chairs.
c. Librarian's work counter.
d. Card catalogue case.
e. Map, globe, newspaper and magazine storage.
f. Legal-size filing space.
g. One or more sloping-top reference stands for dictionary, atlas, and other large books.
h. Book and book-return trucks.
i. Ten to 14 linear feet of tackboard, sections mounted near entrance and display case.
j. Display case visible from both corridor and reading room.
k. Informal reading area—used as a browsing center for six to eight patrons with lounge-type furniture.
l. Movable shelving units should extend not more than six feet from the floor in junior high schools and seven feet feet from the floor in high schools. Shelving should be adjustable, upper and lower shelves should be constructed to adjust the angle so titles of books may be easily read.
m. Electrical outlets should be provided along available wall space.
n. Acoustical treatment in this area is essential.

433.02 Librarian's office-workroom:

433.021 Size: One hundred to 200 square feet.

433.022 Location:

a. Direct access to charge-out desk.
b. Convenient access to storage room.
c. Provide for ease in supervision of reading room.

433.023 Activities: Conferences, typing, telephoning, mending books, reinforcing magazines, etc.

433.024 Equipment and facilities:

a. Librarian's desk and chair.
b. Conference chairs.
c. Typewriter, typewriter stand, and typing chair.
d. Legal-size filing cabinets.
e. Telephone.
f. Two to three electrical outlets.
g. Six to 10 linear feet of work counter, and sink with hot and cold water, storage both above and beneath work counter.

433.03 Storage room:

433.031 Size: One hundred fifty to 300 square feet.

433.032 Location:

a. Adjacent to the reading room with easy access from the office-workroom.

b. Convenient access to the charge-out desk to permit qualified staff to assist pupils in location of periodicals and books.

433.033 Activities: Storage of certain books and back issues of periodicals.

433.034 Equipment and facilities:

a. Maximum, adjustable shelving, open and closed, of appropriate height, width, and depth.

433.04 Instructional aids storage: (Optional. May be combined with the storage room.)

433.041 Size: One hundred to 200 square feet.

433.042 Location: Convenient access from the charging area and direct access to the building corridor.

433.043 Activities: Storage of one or more motion picture projectors on movable carts, combination slide and filmstrip projectors, overhead projectors, portable record players, tape recorders, teaching aids, etc. Simple maintenance and repairs on projectors and other equipment will be done in this room. It will also serve as a center for equipment operators, who will receive assignments and take equipment to designated rooms.

433.044 Equipment and facilities:

a. Small tackboard.

b. Small projection screen on appropriate wall.

c. Cabinet space for temporary storage of filmstrips, slides, tapes, and records used in a day's operation.

d. Work counter equipped with a small vise.

e. Electrical outlets on available wall space, including above counter.

f. Acoustical treatment and forced ventilation are essential.

g. Provide wide door with flush threshold to corridor.

Chapter 5

SCHOOL PLANT SAFETY

School officials have no greater responsibility to their communities than to provide and maintain school plants that will assure every reasonable safeguard to the life and health of persons who enter the premises or use of the facilities connected therewith.

500 *References: Guide*—pp. 153-169.

501 *Structural Safety:*

501.01 The structural-design elements shall provide:

a. The ability of the building to resist lateral forces, such as are imposed by extreme winds and earthquakes.

b. The ability of the building to resist distortion and rapid deterioration from excessive or uneven foundation settling or the overstress of structural members and inadequate tying.

c. The ability of the building to carry the maximum live loads imposed on it by school and community use.

501.02 Adequate checking of these highly technical matters in school plans and specifications is usually beyond the capacity of state reviewing agencies.

501.03 The responsibility for structural and architectural design rests with the architect and structural engineer, who should be willing to sign a statement to the effect that the building plans and specifications are structurally sound and that the building was actually constructed in accordance with the approved plans.

502 *Fire Resistance:*

502.01 One-story buildings may be constructed of any type suitable materials if adequate exit facilities are available, and "hot spots" such as furnace rooms are sufficiently isolated.

502.02 Two-story buildings shall provide acceptable pupil protection against fire hazards with fire-resistive exterior walls, corridors, stairs, and adequate exit facilities.

502.03 Three or more story buildings shall be fire-resistive construction throughout.

503 *Fire Protection:*

503.01 Fire safety in school plants involves among other things: fire-safe construction, adequate exits and rapid evacuation facilities, fire stops, facilities for fire extinquishment, and the insulation of "hot spot" areas.

503.02 Refer to pages 155 through 162 of the *Guide* and appropriate sections of the ***Building Exits Code, Number 101,*** **1961, National Fire Protection Association. Where conflict exists between the** two publications, the latter takes precedence.

503.03 Heating Plant:

a. The furnace room shall be isolated from pupil-occupied areas by location and/or treatment.

b. Heat plant installations shall be in accordance with appropriate state and local Codes.

503.04 Electric Services:

a. All wiring and connections shall comply with the Underwriter's Code.

b. Refer to Section 602.

503.05 Alarms:

a. Fire alarm sending stations shall be located to permit operation when traveling natural paths of egress and also in areas having unusual fire hazards, such as shops, kitchen, heat plant, etc.

b. Warning signals must be audible in all areas of the school plant regardless of other noises and activities.

c. Strident or panic-producing signals shall be avoided particularly in assembly areas where panic hazards are excessive.

d. Refer to Section 605.

503.06 Extinguishers:

a. Fire extinguishers shall be installed according to type, capacity, location, and hazard involved consistent with recommendations of the National Board of Fire Underwriters.

b. Corridor extinguishers should be set or hung in recesses at locations so that each point in the corridor is within 100 feet of an extinguisher.

504 *Circulation, Safety, and Convenience:*

504.01 The educational service value of a school plant may be improved by carefully planning traffic circulation. The principle objectives in planning for safe, convenient circulation include:

a. Safe facilities under all conditions for mass or emergency evacuation.

b. Minimum travel distances for all building occupants in accomplishing the day's work.

c. Minimizing traffic congestion and interference.

d. Reduction of disturbance of classwork because of student traffic.

e. Ease of supervision of student traffic.

f. Desirable segregation of student groups.

g. Easy circulation between building and contemplated future extensions.

504.02 Corridors:

a. The absolute minimum clear passageway of any corridor in a school building shall be six feet and in most instances corridors should be wider. Room and locker doors swinging into corridors shall not at any point of the swing reduce the minimum clear passage.

b. A means of egress shall exist at each end of a corridor, and in no case shall any corridor extend more than 20 feet beyond a means of exit.

c. Doors separating corridors from stair enclosures shall be self-closing type, swing in direction of exit, and contain clear wire-core glazing.

d. Doors opening into stairway enclosures shall not swing across or into required line of travel.

504.03 Stairways:

a. Buildings of more than one story shall have at least two main stairways remote from each other, providing a continuous path of exit travel to the outside.

b. Preferably, stairways should not be located in corridors, but should run at right angles to the corridors.

c. Stairways shall be enclosed with fire-resistive materials consistent with materials used in the general construction of the building.

d. Stairways shall permit at least two lanes of traffic by providing minimum width of 44 inches, clear of all obstructions.

e. Stairways shall have a minimum of three risers, a maximum of 16 risers to the run, and landings between runs with clear width equal to that of the stairway.

f. Risers for main stairways should not exceed six and one-half inches; treads, exclusive of nosing and overhang, and should not be less than ten and one-half inches in width.

   (1) The nosings of all treads and stairway landings shall be constructed and maintained so as to provide non-slip surfaces.

g. Handrails rigidly attached on both sides of the stairway should be 26 to 30 inches above nosing, depending upon age of the pupils.

h. Closets or storage spaces shall not open into stairway enclosures nor shall such space be permitted under or over stairways.

504.04 **Exits:**

a. All buildings, including one-room buildings, shall have at least two means of exit remote from each other.

b. In buildings more than one story in height, first floor exit doors shall be provided in accordance with the following:

  (1) One unit of door width for each unit of required stairs from upper floors;

  (2) Plus one additional unit of door width for each unit of required stairs from basement;

  (3) Plus one additional unit of door width for each 4,000 square feet or fraction thereof of gross area of first floor;

  (4) Plus one additional unit for each 600 square feet or fraction thereof of floor area of auditorium, gymnasiums, or assembly rooms.

c. When double exterior doors are used, a center mullion shall be provided. At least one such exit shall have a removable mullion to permit passage of large objects.

d. The unit width of doorways is 22 inches. The minimum width of any single exit doorway shall be 36 inches, which will be counted as one and one-half units of width.

e. Exits and stairs shall be located so that at least one means of egress will be within approximately 100 feet of every classroom doorway.

f. Exterior doors shall be fitted with antipanic hardware, checks, stops, and closers. (Exception: classroom doors leading directly out-of-doors.)

g. Classroom doors shall open with the line of traffic and shall be fitted with hardware which cannot be locked against egress.

504.05 **Signs:**

a. All auditoriums, assembly areas, gymnasiums, stairways, corridors, and exits should have illuminated signs with "EXIT" in plain, legible letters with direction arrow, if necessary.

505 *Other Circulation and Traffic Problems Which Need Special Attention:*

505.01 The plan of the drive and bus-loading platform should be such that all buses can line up in tandem, permitting children to enter the bus from the right; that is, without crossing either in front or to the rear of the buses.

505.02 At the elementary schools, access to the school grounds should be such that pupils coming to the site do not need to walk through any part of the building to get to the playground.

505.03 Pupil circulation to and from toilet units is simplified when these units and hand-washing facilities are located:

- a. On the normal traffic routes from classrooms to outdoor recreation areas.
- b. Adjoining playgrounds so that the building proper need not be entered by playground users.
- c. Near the cafeteria or lunchroom.

506 *Modernization and Rehabilitation for Safety:*

506.01 No building should be continued in use if it does not provide adequate protection and acceptable health environment and if it is not adaptable to the physical requirements of the educational programs to be housed therein.

506.02 In many older buildings, programs involving major improvements can be undertaken and will prove both advantageous and economical.

506.03 The rehabilitation program should be consistent with the general criteria and standards set up for new buildings.

507 *Disaster Shelters:*

507.01 Public opinion sometimes dictate the inclusion of disaster shelters in school construction. It is therefore recommended that information be secured from the Office of Civil and Defense Mobilization in your particular community concerning such shelters.

507.02 Refer to the *Guide for Architects and Engineers,* NP-10-2, National Plan Appendix Series, Office of Civil and Defense Moblization, 1960; and *School/Shelter, An Approach To Fallout Protection,* Office of Civil and Defense Mobilization, 1959.

Chapter 6

SERVICE FACILITIES

600 References: *Guide* pp. 182-210.

601 *Sanitary Facilities:*

601.01 Water supply and sewage disposal.

601.011 Adequate source of water supply that is both safe and palatable. The State and/or local health departments welcome the opportunity for consultation regarding water conditions prior to site acquisition.

601.012 Ample supply and storage of water should be available at all times for present and future expanded needs—at least 30 gallons per day per pupil for all purposes.

601.013 The temperature of the domestic hot water supply should be thermostatically controlled. In food service facilities where mechanical dish-washing equipment utilized, a separate heating system should be provided in order to maintain adequate water supply at 180 degrees F.

601.014 Water must be safe for use, as determined by State and/or local health authorities, and maintained safe by protection of source of supply; treatment, if necessary; and periodic analysis.

601.015 Sewage disposal system design requires the technical services of a sanitary engineer. The type of installation depends upon the character of the soil as determined by percolation tests, location of wells, and sources of water supply. The State and local health departments will provide maximum assistance in the development of approved sewage disposal systems in rural and suburban areas. (See *Handbook,* Section 802.04)

601.02 Toilet facilities:

601.021 Toilet facilities should be provided for both sexes on each floor level of the school building. Some economy may be achieved if toilet rooms are located adjacent to each other with common utility space between for servicing; the same is true in multistory buildings if the toilets are located one above the other.

601.022 Entrances to toilet rooms should be designed to prevent visibility from the corridor.

601.023 Toilets for public use should be conveniently available to the auditorium, gymnasium, and other parts of the building commonly used by the public. Pupils' general toilet rooms may be strategically located for public use in some cases.

601.024 Toilet room floors preferably should be of ceramic tile or similar impervious masonry material.

601.025 Wall surfaces should be of impervious material, such as glazed tile, to a height of six feet and preferably to the ceiling.

601.026 Stall toilet partitions should be of smooth, nonporous material and should be securely anchored.

601-027 Floor drains, hose bibbs, and cleanout plugs, should be provided in gang toilet rooms.

601.03 Plumbing Fixtures.

TYPE	SCHOOL		NOTES
	Elementary	Secondary	
Water closets:			Ratio in elementary schools applicable only when general facilities are provided. Provide minimum of two in general toilets in other schools.
Ratio: Girls	1-35	1-45	
Boys	1-60	1-100	
Height:	13 in.	15 in.	
Urinals:			Not required in individual classroom toilet rooms.
Ratio:	1-30	1-30	
Height:	18-20 in.	22-24 in.	
Lavatories & Wash Fountain:			Cold and temperate water (maximum 115 degrees F.) with mixing faucet preferable.
Ratio:	1-60	1-60	
Height:	24-27 in.	30-32 in.	
Drinking Fountains:			Preferably separate fixtures; if attached to classroom lavatories, use angle stream fountains.
Ratio:	1-75	1-75	
Height:	24-28 in.	32-36 in.	

NOTE: See Chapters 3 and 4 for additional fixture requirements in special areas of the building.

601.031 Service sinks with hot and cold water should be provided in each custodian's closet, in the custodian's general service room, and in the cafeteria-kitchen.

601.032 Outside frostproof hydrants should be provided at least every 120 feet around the perimeter of the building.

601.033 All valves in the plumbing system should be tagged for identification, and a chart of plumbing layouts should be readily accessible in the head custodian's room.

602 *Electric Services:*

602.01 Adequate electric service and wiring for present and anticipated future loads should be provided to insure maximum efficiency of the electrical system over the years.

602.02 Wiring for bells, program systems, television, public-address systems, and motion picture speakers should be in separate conduit, not in regular service conduits.

602.03 Wherever feasible and possible, electric service should be brought into a meter and switch room specifically designed for this purpose and appropriately located in the school building.

602.04 A directory should be provided for electrical panel boards, and a schematic plan of the electrical systems should be available in the head custodian's office.

602.05 In the various shops, controls to shut off machines in case of an emergency should be strategically located.

602.06 All electrical equipment used in the school should be properly grounded to the electrical receptacles.

603 *Audio-Visual Facilities:*

603.01 Classrooms generally should be equipped to permit the use of all types of audio-visual materials and equipment.

603.02 Adequate provision for controlling the light level in rooms is essential. (For efficient use of all projected materials, the light in the room, particularly in the area of the projector screen, should not exceed one-tenth foot-candle.)

603.03 Double universal service outlets should be installed in the rear of the classroom for projection equipment and in front of the classroom for overhead projectors and audio equipment. An outlet at the side of the room would be useful for supplying power for equipment used by small groups.

603.04 Central sound system conduits should be one and one-fourth inches in diameter in order to provide for possible future installation of television.

604 *Communication and Program Facilities:*

604.01 Refer to comments on telephone, signal systems, and program clocks on page 196 to 198 in the *Guide*.

605 *Alarm Systems:*

605.01 Refer to Section 503.05 of the *Handbook* and Section 45 of the National Fire Protection Association's *Building Exits Code, No. 101*.

605.02 Alarm sending stations shall be provided near all main exits and in the natural path of escape from fire, at readily accessible and visible points.

605.03 Signals providing alarm to other potential emergencies should be distinctly different from the one used to evacuate the building in case of fire.

606 *Custodial Service Facilities:*

606.01 Adequate and appropriate space, facilities, and services should be provided for the custodial employees including locker, shower, toilet, and lavatory facilities.

606.02 In large schools, it is desirable to set aside a small office near custodial quarters for the head custodian where facilities will be available for preparing and filing reports, requisitions, schedules, and records; and for holding private conferences.

606.03 Even in systems with central repair shops, some local repair work will be needed. Workshop facilities, including work bench, tool and supply cabinet, vises, and power outlets for these repair jobs are essential.

606.04 It is preferred that a single point in the building be designated as a receiving area for deliveries of general school supplies.

606.05 Receiving room doors, both interior and exterior, should be wide or double to permit passage of large bulky equipment and supplies.

606.06 A central fire-resistive storeroom should be provided for general custodian supplies and equipment and preferably located near or in connection with a central receiving center.

606.07 Ample storage facilities should be provided for tools and equipment used on grounds and the exterior of the plant. The area shall be accessible only from the out-of-doors.

606.08 Ample space should be provided at strategic and convenient locations for temporary storage of waste materials.

606.09 An incinerator should be installed to burn refuse. The incinerator, either indoor or outdoor, and space occupied should be designed with special consideration of the waste to be disposed of daily, fire hazards, and fire insurance rates.

606.10 A freight or service elevator for supplies and equipment is desirable in multistory buildings, particularly in schools with large enrollments.

606.11 Some school buildings—particularly large high schools—should have laundry facilities for cleaning physical education, food-service, custodial, and other equipment and supplies.

606.12 As portable electric floor cleaners are frequently used, ample electrical outlets should be located at convenient points not more than 75 feet apart in corridors and rooms.

607 *Storage Other Than Custodial:*

607.01 Fire-safe vault or fire-resistive files should be available for storage of pupil and school records and valuables, in the administrative area.

607.02 Government donations of surplus foods, some of the bulky nature, may create a need for a substantial amount of storage space suitably located convenient to the cafeteria-kitchen.

607.03 Appropriate provisions should be made for the storage of wraps of pupils, teachers, and other school employees during the school day. No single plan for such storage can be applied to all schools. Whatever plan is adopted, the following factors should be considered:

a. Convenience for individuals wearing the clothing.
b. Safety from theft or vandalism.
c. Sanitation.
d. Adequate ventilation.
e. Orderly arrangement in appearance.
f. Economy of provisions.

608 *Miscellaneous Service Facilities:*

608.01 Parking spaces, walks, and entrances should be adequately lighted by artificial means, chiefly floodlights, located at strategic points within or upon the buildings, or upon poles or standards.

608.02 Parking space should be provided for automobiles of school employees, pupils who drive their own cars to school, for visitors, and frequently for the school buses which are idle during the day. Such parking space, if possible, should be screened from the view of the general public passing the school building.

Chapter 7

COMMON ENVIRONMENTAL FACTORS

700 References: *Guide* pp. 170-182, 213-243

701 *Thermal Environment:*

701.01 The quality of the thermal environment in the classroom, that condition of the air and surrounding surfaces which affects the physical and mental comfort of the student, can affect the ability of the student to grasp instruction.

701.02 Minimum functions of the heating and ventilating system employed to maintain the proper thermal environment in a school building are:

a. Supplying heat for warm-up and balancing heat losses from the room to the outside.

b. Supplying tempered outside air for the removal of excess heat.

c. Diluting and removing upleasant odors by ventilation.

d. In special cases, removing injurious or obnoxious gases, vapors, fumes, and dust by the induction of outside air or by filtration.

701.03 Heating plants and ventilating systems should be of sufficient capacity to meet the requirements within the building during the period of occupancy under extremes in local weather conditions, without sustained operation beyond the rate of capacity of the system.

701.031 Operative temperature: Heating systems of conventional design should provide the following temperatures:

a. Classrooms, auditoriums, offices, cafeterias–70 degrees F.; measured 30 inches above the floor;

b. Closed corridors, stairways, shops, laboratories, and kitchens–68 degrees F.; measured 60 inches above the floor;

c. Activity rooms, such as gymnasiums–65 degrees F.; measured 60 inches above the floor;

d. Special cases: Toilet rooms–65 degrees F.; locker rooms and showers–78 degrees F.; swimming pools–83 degrees F.; measured 60 inches above the floor.

e. The maximum temperature gradient from floor to 60 inches above the floor should not exceed three degrees.

701.032 Air supply.: Ventilating systems should have capacity to provide, and heating systems should allow for the introduction of fresh outdoor air as follows:

a. For the removal of body odors in areas where no special odor source exists, as in classrooms and libraries, a minimum of 10 CFM per person. The cooling load should be determined separately, and the total air circulation capacity selected on the basis of the cooling requirement, which will usually require air capacities larger than those indicated above;

b. Six air changes per hour, not necessarily all outside air, whenever or wherever unusual odors are likely to occur, such as in toilet and locker rooms, chemical and food laboratories, and kitchens. Toilet room ventilating systems should be entirely independent of those serving the rest of the building.

c. When odors, obnoxious fumes, and dust arise from localized sources, they should be removed by special vents at sources.

d. Six to eight air changes per hour should be provided through mechanical supply ventilation in auditoriums and other spaces where large numbers of pupils assemble. Twelve to 15 air changes per hour may be desired in auditoriums or other assembly spaces in summer, if air conditioning is not provided.

701.033 Air movement: Air movement in occupied areas generally should not exceed:

a. During the heating season, 25 linear feet per minute.

b. During mild weather (for cooling) 100 linear feet per minute;

c. Special provisions may have to be made in the window zone to overcome the effects of cold window down draft in order to keep air velocities within this limitation.

701.034 Humidity control: Unless special provision has been made in the building design, such as the use of dual glazing and vapor barriers in the outside wall, it is generally impractical to maintain relative humidities in classrooms in cold weather much above those which occur naturally.

701.035 Air cleaning: Air cleaning may be essential in areas where the air is heavily laden with dust or smoke. Washing, screening, precipitation, absorption, or other cleaning methods may be used.

701.036 Radiant temperature: Reduced radiant temperatures are usually compensated for by increased air temperatures. Special treatment of the window zone may be desirable to compensate for the greatly reduced radiant temperature there as compared with the rest of the room.

701.05 Some form of cooling system is desirable and may be essential for schools in areas where the outside temperature is above the optimum during a portion of the school year.

701.06 Determining the type of heating and ventilating system to be used is a highly technical problem dependent upon the original cost, the operating cost, the maintenance services available, the size of the building, the level of student comfort which can be economically obtained, and in some instances the designers preference. Technical advice concerning the type of heating and ventilating system to be utilized should be secured from independent consultants and engineers qualified to deal with heating and ventilating problems.

701.07 Zone control heating and ventilating systems should be provided in order to secure the maximum utilization of facilities and the greatest economy in operation. Zone control refers to large general areas of the building rather than individual rooms within areas.

701.08 Boards of education, before accepting the heating contractor's work, should receive complete written instructions regarding the operation and maintenance of the mechanical equipment, and should insist that a designated school employee be given direct instruction by one or more competent representatives of the contractor or equipment firms.

702 *Visual Environment:*

702.01 General:

702.011 Refer to pages 213-224 of the *Guide* for additional information concerning this topic.

702.012 Technical assistance from qualified lighting consultants is generally required to secure adequate visual conditions within classroom spaces. NOTE: Electric power companies usually employ competent lighting engineers to assist in finding solutions to lighting problems.

702.013 Plans and specifications for new plants should be developed to achieve as many of the desired lighting goals as possible in original construction with due consideration for the need of maintaining a balance between the visual and other major environmental factors.

702.014 The proper visual environment lessens the expenditure of energy required for students and teachers to carry on visual tasks in classrooms.

702.015 A sufficient quantity of light is essential for good seeing conditions. A task, however, becomes visible not by the light falling upon it, but by reflected brightness.

702.016 Visual comfort and efficiency may best be achieved in an environment in which the brightness-difference would be as small as possible between the task and the brightest surface, and between the task and the darkest surface in the total visual field while the general level of illumination is high.

702.017 The wide acceptance of informal seating in the classroom, the visual field, therefore, must be recognized as encompassing all four walls, the floor, and the ceiling.

702.02 Desirable Brightness:

702.021 In a classroom, the brightness of any surface viewed from any normal sitting or standing position should not be excessively greater than the brightness of the visual task. As the high brightness of surfaces in the visual field approaches the brightness of the task, visual comfort and efficiency increase. Present research indicates that the highest acceptable brightness of any surface in the visual field should not be greater than 10 times the brightness of the task.

702.022 In a classroom the brightness of any surface viewed from any normal standing or sitting position should not be excessively lower than the brightness of the visual task. As the low brightness of the surfaces in the visual field approaches the brightness of the task, visual comfort and efficiency increase. Present research indicates that the lowest acceptable brightness of any surface in the visual field should not be less than one-third the brightness of the task.

702.023 The brightness of surfaces immediately adjacent to the visual task is more critical in terms of visual comfort and efficiency than that of more remote surfaces in the visual field. These adjacent surfaces have lower acceptable brightness limits than surfaces farther removed from the task. Present research indicates that surfaces immediately adjacent to the visual task should not exceed the brightness of the task.

702.024 The brightness-difference between adjacent surfaces in the total visual field should be reduced to an acceptable minimum.

702.025 The characteristics of any lighting system should be such that direct and reflected glare are not objectionable. If the brightness-difference produced by a lighting system are held within the limits stated in Goals 1, 2, and 3, direct and reflected glare will not be objectionable.

702.026 Daylight and electric light systems should conform to the same brightness and brightness-difference goals, and both systems should be coordinated in design to assure the effective contribution of both.

702.027 Any lighting system should be designed in such a manner that it will contribute to a cheerful, friendly, and aesthetically pleasing classroom environment.

702.028 The brightness goals stated above assume an illumination level of range 30 to 50 foot-candles on the reference task produced by combined radiant energy of daylight and any system of electric lighting used.

702.03 Light Sources:

702.031 Electric lighting systems should be evaluated on the basis of the following:

a. The lighting should produce a uniform distribution of shadow-free and glare-free illumination with the intensities necessary to maintain an acceptable brightness-balance between the tasks and other surfaces within the total visual environment.

b. Consideration should be given to probable deterioration of efficiency in service under prevailing conditions of school operation and maintenance.

c. Lighting fixtures should not produce a surface brightness on the fixture or on the ceiling that exceeds ten times the task brightness.

702.032 Where daylight supplements artificial illumination controls, preferably fixed, should:

a. Exclude direct sunlight and at the same time admit as much light as possible;

b. Provide a surface free from excessive brightness or glare;

c. Permit ease of maintenance.

702.04 Surfaces within rooms should be finished in accordance with the following:

702.041 Ceilings should provide an 85 per cent reflection factor flat white surface.

702.042 Upper walls from wainscot or dado should provide a minimum of 60 per cent reflection factor surface.

702.043 Lower walls from wainscot or dado height down, including baseboard, should provide a minimum of 40 per cent reflection factor surface.

702.044 Finishing entire wall surfaces from ceiling to floor with a 60 per cent reflection factor is considered good practice where maintenance conditions permit.

702.045 Finishes should be flat or matte on all interior surfaces, particularly, at eye level or above.

702.046 Trim should provide a 40 to 60 per cent reflection factor surface.

702.047 Desk and equipment finishes should have from 30 to 50 per cent reflection factor range.

702.048 Floor finishes should have from 30 to 40 per cent reflection factor range.

702.049 Chalkboards are available with practicable maximum reflection factor range from 20 to 25 per cent. This high-factor range is practical only when the level of illumination is sufficiently high to overcome the loss in visibility due to reduced brightness-difference between chalk and light colored board.

703 *Sonic Environment:*

703.01 General:

703.011 Refer to pages 227-235 of the *Guide* for additional information concerning this topic.

703.012 The modern educational program is of such a nature that sound engineering should be a studied design aspect of all educational spaces. Technical assistance from qualified personnel is required to secure adequate conditioning of space.

703.013 Although it is often not possible to prevent the creation of unwanted noises, it is both possible and practical to prevent excessive noises which inhibit easy hearing and create distractions.

703.02 Zoning:

703.021 The concept of zoning as related to sound engineering revolves about the basic premise, the prevention is better than correction.

703.022 Site:

a. Every effort should be made to acquire the site that has a relatively low ambient noise level.
b. If a noisy site cannot be avoided, then it is necessary to locate the school's noisy activities nearest the noise source.
c. Plantings of trees, bushes, and scrubs around the perimeter of the site, particularly on noisy sides, will provide added noise reduction.

703.023 The building:

a. It is important, where possible, to group noisy activities with other noisy activities, such as playgrounds, gymnasiums, music areas, shops, and other such activities.
b. The administrative facilities, general classrooms, library, and other similar activities should be grouped together in a quiet zone at a distance somewhat removed from the noisy activities.

c. Intermediate between the two extremes may be typing or bookkeeping rooms where machines are used, the cafeteria, and home economics facilities.

d. If these various activity levels are not adequately separated in space, it is necessary to intercept noise to the degree necessary to prevent them from conflicting with each other.

703.024 Instructional and service facilities:

a. Administrative offices:

(1) Noise reduction, treatment in the form of absorbative materials is invariably mandatory to keep speech levels low and to reduce office machine and traffic noise to a minimum.

(2) It is advisable to provide sound intercepting barriers to keep noisy activities in some administrative rooms from interferring in others.

b. Corridors:

(1) Unless adequate noise reduction treatment is provided in the corridors, they act as communication channels conveying sound or noise throughout the building.

(2) Acoustical treatment in such passageways should be placed on the ceiling and may also be placed on walls.

(3) Undesirable noise may be reduced by proper attention to nonparallel floor or walk surfaces and ceiling surfaces.

c. Classrooms:

(1) Classrooms should be adjusted for critical reverberation control facilitating the propagation of sound as well as treated for noise reduction.

(2) The degree of sound interception required in classroom boundaries depends upon adjacent activities.

(3) In the case of certain business education rooms, noise reduction treatment is to be preferred over critical reverberation control, and the boundaries must have a higher degree of sound interception, particularly where such rooms are near or next to the more academic type classrooms.

d. Libraries:

(1) Noise reduction treatment is the primary requisite in libraries, coupled with adequate sound interception where there may be disturbing or distracting sound from a nearby activity.

e. Shops:

  (1) Adequate noise reduction treatment is essential, and adequate interception should be provided in the boundaries.

  (2) Where doors are left open, shop layouts must be oriented so that openings are away from academic and other similar activities.

f. Cafeterias:

  (1) An environment with a somewhat critical reverberation control is desirable with particular stress upon sound absorption in the high pitches.

  (2) Kitchens should have considerable noise reduction treatment because the noise from a reverberant kitchen can be conducted to the dining area.

g. Gymnasiums:

  (1) Usually an environment with a somewhat critical reverberation control is desirable.

  (2) Where facilities are near quiet areas, adequate interception must be built into the boundaries.

h. Toilets:

  (1) Better planned schools provide noise reduction treatment in rest rooms as well as special sound interception measures within the room boundaries.

i. Music rooms:

  (1) Choral, band, orchestral rehearsal rooms require critical reverberation control over a wide range of pitches.

  (2) Maximum noise reduction is not the correct solution.

  (3) Generally, acceptable criteria for the environment in rehearsal rooms have not been established as yet.

  (4) Individual practice rooms are usually most satisfactory when provided with the maximum noise reduction treatment.

  (5) Maximum sound interception is advisable.

  (6) Special attention should be given to insure that strategic walls are not reduced in interception by the insertion of clocks, electrical outlets, ventilating grills, etc.

  (7) Ducts in ventilating systems should be given special treatment to prevent transmission of sound.

j. Auditoriums:
   (1) The auditorium is one of the most critical rooms in the entire plant.
   (2) All noise levels must be kept low, including noise from the ventilating system, heating system, water supply, and external sources.
   (3) Adequate barriers to intercept sounds from other activities in the school from traffic, mechanical equipment rooms, etc. must be provided.
   (4) The proper acoustical environment of the auditorium is a highly scientific problem, therefore, a technical assistance should be secured in order to provide a reasonable environment.

704 *Aesthetic Environment:*

704.01 Refer to *Guide*, pp. 235-239 regarding this aspect in planning of the school buildings.

704.02 The total effect of the building upon occupants and visitors is usually recognized as beauty—the aesthetic aspect of conditioning spaces both indoors and outdoors.

704.03 The school plant, when truly functional, is beautiful because it not only fulfills a physical function but also an emotional function.

705 *Balanced Conditioning of Spaces:*

705.01 Designing to achieve adequate and economical conditioning of educational spaces must be done by persons highly specialized in each of the separate major fields involved.

705.02 Factors involved in the conditioning of spaces for education include:

a. Spatial—Pages 211-213 of the *Guide;* Chapters 3 and 4 of the *Handbook.*
b. Thermal—Pages 170-182 of the *Guide;* Section 601 of the *Handbook.*
c. Visual—Pages 213-224 of the *Guide;* Section 602 of the *Handbook.*
d. Sonic—Pages 227-234 of the *Guide;* Section 603 of the *Handbook.*
e. Aesthetic—Pages 235-239 of the *Guide;* Section 604 of the *Handbook.*

705.03 A crucial problem in good planning is to be aware of and to guard against the disposition of each design specialist to overdo the solution in his particular field. Balancing the solutions among the specialized designed fields becomes one of the most important responsilibities of the administrator and architect.

705.04 Balance in providing adequate space and in conditioning it for safety and educational usefulness results from a defined and executed school district policy.

705.05 School district policy should require as a minimum that a school housing conditioning be comparable to that used in nonschool structures, such as homes, offices, government buildings, churches, clubs, and lodge halls.

705.06 If comparable structures generally do not meet acceptable criteria, then it may be that school's conditioning should set an example.

705.07 When balance is threatened by inadequate funds of high bids, a defenseful procedure in making plan and specification cutbacks is one based upon priorities carefully established before the actual time for decisions. Such a list should also identify those provisions that should not be deleted nor seriously compromised because of their importance to:

a. The safety and health and comfort of teachers and pupils.

b. The operational success of the educational program.

c. The protection of the investment of the building.

d. The maintenance and repair budget.

705.08 Reductions in building areas should be made on the basis of complete facilities and services rather than by reduction of dimensions below good practice for facilities retained. Temporary elimination of some spaces is preferred to over-all reduction in quality.

705.09 Refer to *Thirteen Principles of Economy in School Plant Planning and Construction,* National Council on Schoolhouse Construction, to secure additional information regarding the economics involved in balanced conditioning of the spatial, thermal, visual, sonic, and aesthetic elements of the school environment.

705.10 The complexities of the school plant planning requires nothing less than the highest available architectural engineering and technical competence in the various environmental areas if planners are to realize long-term aims of comfort, efficiency, and economy as well as immediate cost of construction.

706 *Fire Insurance, a Factor in Balanced Conditioning:*

706.01 Some economy in the life-time operation and maintenance of a building may be achieved when future fire insurance assessments are considered in planning stages.

706.02 Items affecting insurance premiums include:

a. The building's exposure to adjacent properties not under the jurisdiction of the board of education.

b. The location and treatment of "hot spots" or potential hazards within the building.

c. The degree of internal and external protection, such as heat and smoke detectors, sprinklers, extinguishers, and alarms strategically located; accessibility of hydrants, fire-fighting equipment, etc.

d. The degree of fire-resistance of component construction materials and the building totally.

706.03 For new construction, the degree of fire safety and insurance costs can be estimated by having plans and specifications reviewed by the West Virginia Rating Bureau during final stages of preparation.

Chapter 8

RELATED INFORMATION

801 *Statutes:*

801.01 School plant construction or improvement projects are frequently influened or regulated by various statutes of the Code of West Virginia. Listed are sections with which school personnel should be familiar.

Chapter	Article	Section	Michie No.	Subject
10	2	1-5	642-646	Public Recreation and Playgrounds
10	2A	1-26	647 (1-26)	Athletic Establishments
11	3	9	678	Property Exempt from Taxation
11	8	5-32	756-766 (17)	Levies
11	8A	1-13	766 (18-30)	County-Wide Levy for District Debt Service
11	13	16	974	Prerequisite to Final Settlement with State or Political Subdivision Contractor; Penalty
13	1	2-4	1054-1056	Bond Issues for Original Indebtedness
16	1	3	1267	Board of Health Powers and Duties; Rules and Regulations
16	1	9	1273	Supervision over Local Sanitation
18	3	9a	1749 (1)	Authority of State Supt. in Respect to Safety of Buildings
18	4	10	1760	Duties (5): Close temporarily schools for health, safety, and welfare reasons
18	4	11	1761	Duties (3): Recommended for condemnation buildings unfit for use
18	5	5	1766	Exemption of School Property from Legal Process and Taxes
18	5	6	1767	Validation of Land Titles by Possession of District Board
18	5	7	1768	Disposal of School Property; Oil and Gas Leases
18	5	8	1769	School Site Condemnation
18	5	9	1770	Building and Equipment

Chapter	Article	Section	Michie No.	Subject
18	5	10	1771	Approval of State Board of Education of Plans and Specifications
18	5	11	1772	Joint Buildings
18	5	12	1773	Bond of Contractors
18	5	13	1774	General Control of Schools; Consolidation; Transportation of Pupils
18	5	25	1786	Duties (3): Secretary of District Board, General Duties—Care for and keep records including evidences of title, contracts and obligations—accessibly arrange for reference
18	5	36	1795 (2)	Payment for Fire Service on Public School Property
18	9	1-7	1856-1862	School Finances
18	9C	1-5	1862 (37-41)	State Aid for Repair and Construction of Public School Buildings
21	5A	1-11	2357 (1-11)	Wages for Construction of Public Improvements
29	3	1-33	2787-2790 (6) 2802, 2808	State Fire Marshal; protection Against Fire
30	12	3	2957	Use of Title "Architect", etc.
30	13	13	2974 (4)	What Plans of State and Political Subdivisions to be approved by Registered Engineer
38	2	39	3760	Public Buildings; Bond of Contractor, No Lien in Such Case
54	1-2	1-11 1-12	5361-5391	Eminent Domain
61	10	15	6108	Pecuniary interest of county and district officers, teachers and school officials in contracts; exception; offering or giving compensation; public

802 *Approval of Plans and Specifications:*

802.01 Under statutory authority granted the West Virginia Departments of Education and Health and the Fire Marshal's Office regulations requiring the approval of plans and specifications for construction of new buildings, additions, and major alterations have been adopted.

802.02 Review of preliminary plans and specifications—Two sets should be submitted separately to State agencies as follows:

802.021 One set should be submitted to the Department of Education for review and approval. This set will also be used by the Health Department for review and approval of food service facilities. (See 802.04)

a. Comments and approval from the above agencies will be sent to the superintendent and the architect.

802.022 One set should be submitted to the Fire Marshal's Office for review and approval.

a. Comments and approval will be sent to the superintendent and the Department of Education.

b. The plans and specifications, with recorded comments, will be sent directly to the architect.

802.03 Review of Final Plans and Specifications; two sets shall be submitted to State agencies as follows:

802.031 One set accompanied by the Application for Approval shall be submitted to the Department of Education for review and approval. This set will also be used by the Health Department for review and approval of food service facilities. (See 802.04)

a. Comments and approval from the above agencies will be sent to the superintendent and the architect.

802.032 One set shall be submitted to the Fire Marshal's Office for review and approval.

a. Comments and approval will be sent to the superintendent and to the Department of Education.

b. The plans and specifications with recorded comments will be sent directly to the architect.

802.04 Schools in Rural and Suburban Areas: A plot plan, sewage disposal system plan, water supply system plan and information regarding initial and ultimate number of occupants of the proposed school shall be submitted for approval during the preliminary planning stage to the Chief, Engineering Section, Sanitary Engineering Division, West Virginia Department of Health.

802.05 Certificate of Approval: The certificate will be issued by the Department of Education, to the superintendent and architect following review and approval by the three State agencies.

803 *Content of Documents Submitted for Approval:*

803.01 Preliminary plans and outline specifications should include the following:

a. Plot plan-size and shape of site; orientation; general topography; location of building, streets, and highways; means of sewage disposal; and tentative development of the site.

b. Floor plans—minimum scale of 1/16 inch; type of wall, floor, partition, roof, and stair construction; size and purpose of rooms; stairs, corridors, doors, windows, plumbing fixtures, and built-in equipment; and probable future additions.

c. Elevations—at least one side of the building; over-all dimensions; finished floor and ceiling levels; finished outside grade level; windows, doors, steps, areas, retaining walls, etc.; and materials.

d. Sections explaining any conditions not made clear on other drawings.

e. Proposed service connections—including gas, water, electricity, and sewer; and location of wells and sewage disposal system if any.

f. Outline specifications — augment information shown on drawings.

803.02 Final plans and specifications shall include the following:

a. Site or plot plan—size and shape of site; adjoining streets or highways, walks, etc.; position of building on site; location and connections of all service lines; finish contours with finish grades at building and elevation of first floor; location of wells and sewage disposal system, if any; general landscaping; and location of walks, driveways, parking areas, exterior steps, etc.

b. Floor plans—each floor and roof at not less than ⅛ inch scale; footings and foundations, dimensions and reinforcing; schedule showing type and size of each door and window; complete figures so that sizes and thickness of walls and partitions can be readily determined; level of finished floors; furred walls and ceilings; door swings; location of built-in equipment; floor construction; run, dimensions and spacing of joists and girders; notation of safe live loads; materials.

c. Elevations—same scale as architectural plans.

d. Sections—same scale as that of floor plans or larger, to show clearly and special conditions; typical stairs, classrooms, and corridors; equipment and fixtures; floor construction, levels and thickness; wall and ceiling construction; typical windows; interior and exterior doors; finish material; roof construction, etc.

e. Details—larger scale; showing typical exterior wall sections, footings, foundations, floors, windows, cornice, roof, and so on, showing all vertical dimensions; each type and size of door with glazing and paneling, if any, frame and trim; complete details for each type of window, together with distances to floor and ceiling; stair details showing risers, treads, handrails, newels, landing lines, etc.; chalkboard and tackboard trim, chalk troughs, and heights; built-in equipment, counters, cupboards, drawers, etc.; wardrobes, unless of standard manufacture.

f. Plumbing plans—foundation drain lines, storm and sanitary sewer lines, and complete water supply system; location of all plumbing fixtures, including hose cabinets, if any; and sewage disposal system, if any. (See k)

g. Heating and ventilating plans—size and type of heat unit, with all connections; pumps; all supply and return lines with sizes, valves, slopes, etc.; motors and fans showing types, periphery speed, capacity, air velocity in ducts, etc.; location, sizes and capacity of all ducts, grilles, ventilators, etc. (See k)

h. Electrical plans—use standard symbols to show all connections, inside and outside; location of wall, floor and ceiling outlets or receptacles; location and size of all conduits; capacity of outlets; location and details of switch panels, circuit breakers, fusing, etc.; location and connections for all bells, alarms, clocks, special outlets; types and designs of lighting fixtures. (See k)

i. Structual plans—showing all concrete and steel columns, beams, trusses, girders, joists, slabs, reinforcing, etc.; fireproofing of structural members; details, diagrams, and schedules as required for a complete understanding of plans. (See k)

j. Complete specifications—augment the information shown on the drawings, giving details on construction materials and methods, mechanical equipment and installations, tests, etc. In general, specify all window shades, toilet room accessories, lockers and all other permanent equipment forming an integral part of the building.

k. For small building, plans f, g, and h may be combined in one plan designated *mechanical* plans, and plan i (structural) may be shown on general plans.

803.03 Application for Approval of Preliminary and Final Plans and specifications: The application shall acompany all final plans and specifications and should accompany preliminary plans and outline specifications.

APPLICATION FOR APPROVAL OF PRELIMINARY AND FINAL PLANS AND SPECIFICATIONS

The undersigned hereby applies for approval of preliminary-final plans and specifications described herein:

County	Name of School
Address	Post Office

I certify that the Plans and Specifications herein described have been prepared by me and are to the best of my knowledge structurally sound and in accordance with current West Virginia School Building Standards.

Firm name ______________________ Architect(s)

by ______________________ Architect

Date __________ Approved by: ______________________
Secretary, Board of Education

SCOPE OF PROJECT:

New building ________ Addition ________ Remodelling ________

DATES:

Receipt of bids ________ Anticipated completion ________

Approval: ________ Education ________ Health ________ Fire ________

BUILDING AND SITE CHARACTERISTICS:

Area of site ______ Acres

Water Supply
City ______
Individual ______
If Individual, please give details
____
____

Sewage:
City sewer ______
Disposal system ______

Framing:
______ Wood
______ Steel
______ Masonry
______ Reinforced concrete
______ Other
(specify)

Outside wall material:
______ Wood
______ Metal
______ Masonry
______ Concrete
______ Other
(specify)

________Fire resistive
________Semi-fire resistive
________Combustile

________Fire protection available
________Approved exits
________Approved fire alarm system

Type of approved heating, air conditioning, and ventilation systems
____
____

Total space: Cubage ________________c.f. Area ________________s.f.

EDUCATIONAL CHARACTERISTICS:

Grades housed ________ to ________

Pupil capacity ________________

Type of Space	Number
General purpose classroom:	
Elementary	______
Secondary	______
Agriculture	______
Art	______
Business education	______
Driver education	______
Home economics	______
Industrial arts	______
Music	______
Physical education	______
Science	______
Vocational education	______

Type of Space	Number/Capacity
Administration	______
Auditorium-assembly	______
Library-Instructional materials center	______
Food service:	
Dining	______
Kitchen	______
Combinations:	
Gymnasium-auditorium	______
Cafeteria-assembly	______
Multipurpose room	______
Toilets	______
Custodial	______

ESTIMATED COST:

General Construction	______
Heating and ventilating, plumbing and electric	______
Total	______
Site	______
Site development	______
Furniture and equipment	______
Total	______
Architect and Engineering fees	______
Legal and administrative fees	______
Contingencies	______
GRAND TOTAL	______

Estimated cost:
Per square foot $________
Per cubic foot $________

COMMENTS: ____
____
____
____

804 *Basis for Area and Cubage Computations:*

804.01 The "Application for Approval" requires data on area and cubage of proposed buildings. The information is necessary so that the Department will be in position to make space and cost comparisons as well as to disseminate construction data to interested persons. If area and cubage data are to be valid in comparison, the same method of computation must be used.

804.02 Area: Include the following areas taken in full to the outside surfaces of the building:

a. All finished rooms not otherwise excepted below.

b. Include open porches with shelter over at one-half their actual area taken to the outside surface of the building.

c. Include open porches and platforms without shelter; and areaways for windows, entrances, etc., at one-fourth their actual area taken to their outside surfaces.

804.03 Cubage: Compute volumes of the actual spaces enclosed within the outer surfaces of the outside walls, and contained between the uppermost ceiling surfaces and the horizontal plane located six inches below the bottom of the lowest floor construction.

a. Take the following volumes in full: finished rooms; parapets; retaining walls, etc., attached to the building; towers, cupolas, bays, oriels, dormers, penthouses.

b. Take the following volumes at one-half actual value: roof spaces; unfinished foundation spaces measured from bottom of lowermost floor construction to bottom of footers; pipe trenches and tunnels; and open porches with shelter over.

c. Take the following volumes at one-fourth actual value: open porches and platforms without shelter over and areaways for windows, entrances, etc.

805 *Standards for Architectural Service:* (Adopted by the West Virginia Chapter of the American Institute of Architects.)

PREFACE

The architect renders a valuable and varied service to his client in verbal, written or graphic form. As his compensation for services is derived solely from the client in fees, it is necessary that such fees be adequate to permit the architect to render the highest quality of service.

To produce and maintain a high standard of practice on the part of its members, the West Virginia Chapter of the American Institute of Architects has prepared and adopted the following outline of services and the recommended schedule of fees:

SECTION A .... THE ARCHITECT'S SERVICES

I. NORMAL SERVICES

These are usually rendered in sequence, in three stages as follows:

1. Preliminary Stage.

The architect, in the determination of a program and in the preparation of preliminary sketches and recommendations, generally renders the following services:

a. Confers with client to outline project, discuss purposes, general plan and design, its feasibility, location, general type of of construction and equipment, discusses the probable time required to build, the approximate costs and the means of financing.

b. Visits site and studies project placement.

c. Studies efficient method of operating the project for its purpose.

d. Examines laws, ordinances, codes, standards, rules and regulations of governmental authorities and studies requirements of insurance carriers.

e. Prepares small scale preliminary drawings.

f. If project so warrants, prepares written recommendations to accompany sketches, describing construction, materials, equipment, estimated time for project construction and probable cost.

g. Submits preliminary sketches and recommendations to client for study, for modification, if desired, and finally for his approval.

Upon tentative approval of preliminary sketches and recommendations the services of the *Preliminary Stage* have been completed.

2. Working Drawing Stage.

The architect, in the preparation of drawings, specifications and other documents, generally renders the following services:

a. Develops and completes drawings including all essential architectural, mechanical and engineering drawings and site improvements, not including landscaping. These are generally presented in the form of plans, elevations, sections, details, schedules, and notes.

b. Prepares specifications describing type and quality of materials and finish and the manner of construction.

c. Prepares General Conditions which outline the circumstances under which the project is to be constructed. These should be bound with the specifications, but they are supplementary to both the drawings and the specifications.

d. Furnishes client a minimum of four sets of plans and specifications, any additional sets beyond those stipulated in Agreements to be furnished at actual cost.

NOTE: Working drawings are the development of preliminary sketches, and specifications are the development of preliminary recommendations and as such they should not vary materially therefrom except by client's consent. Drawings and specifications complement each other. They are instruments of service and as such remain the property of the architect.

Upon delivery to client of the stipulated sets of drawings and specifications, the services of the *Working Drawing Stage* have been completed.

3. Construction Stage.

The architect, in the preparation of contract documents and in the supervision of construction work, generally renders the following services:

a. Prepares bid forms for bidders' use and advises client as to qualifications of prospective bidders.

b. Assists in obtaining and tabulating bids.

c. Assists in preparation of contract documents between owner and contractor.

d. Assists in obtaining approval of such documents from governmental agencies when required.

e. Inspects construction work from time to time as necessary to check progress of work and compliance with contract requirements and to guide contractor in the interpretation of contract documents for a full performance of his contract.

NOTE: The architect's supervision does not include a full-time supervisor or clerk-of-the-works. Such special service, if required, shall be paid for by the client.

f. Advises client as to progress and quality of construction work.

g. Prepares full-size detail drawings or other supplementary drawings when necessary to assure compliance with contract requirements.

h. Checks shop drawings submitted by contractor for approval.

i. Issues change orders covering any modifications of contract.

j. Audits contractor's application for payments, and issues certificates authorizing such payments.

k. When satisfied that contractor has fulfilled the terms of his contract, accepts the contractor's work on behalf of the client and issues statement to that effect. Such statement to be filed with client and contractor and, when required, with surety and insurance carriers.

Upon acceptance by the architect of all contracts under his supervision, the services of the *Construction Stage* have been completed and with it the entire services normally rendered by him are also completed.

II. SPECIAL SERVICES

Special services are often performed by the architect for the client in addition to the Normal Services. If not stipulated in architect's Agreement, the additional charges should be agreed upon before rendering such special services. Following is a tabulation of the special services often rendered, although others may at times be required:

a. Preparation of perspective renderings or rendered drawings.

b. Preparation of scale models.

c. Full-time supervision or services of a clerk-of-the-works.

d. Sets of drawings and specifications in addition to the number stipulated in Agreement.

e. On major projects, the services of a specialist in structural or mechanical branches or of a general consultant are sometimes required. When client approves employment of such, the full cost should be paid by client in addition to the fee for Normal Services.

f. Designing furniture, equipment, fixtures, hangings or decorative work or assisting in the selection or purchasing of such items.

g. Consultation on matters where architect is not otherwise retained.

h. Serving as expert witness.

i. Special travel in interest of client.

j. Client should furnish at his own expense complete and accurate survey of site, giving grades, contours, lines of streets or highways and adjoining properties, and location of utility services. Where necessary to ascertain the nature of the soil and sub strata, the client should also provide test borings and test pits. Where the architect is required to assist in such matters, he should receive compensation therefor in addition to the fee for Normal Services.

SECTION B ________________ THE ARCHITECT'S FEES

I. BASIS OF DETERMINING FEES

1. The architect's compensation or fees for Normal Services are usually established as a percentage of the total cost of a project. Other methods for determining fees, such as Cost Plus Percentage, Cost Plus Lump Sum or Lump Sum basis are sometimes used.

2. If project is to be constructed under more than one contract, such as general construction, plumbing, heating, electric work, etc., the architect's burden of service and responsibility is increased. In such cases the stipulated fees should be increased a minimum of 2% of the value of those contracts segregated from the general contract. Complete segregation of contracts and the elimination of a general contract including basic building trades such as masonry, carpentry, lathing, plastering, etc., is not recommended, for the architect's function should not be confused with that of the contractor.

3. Fees higher than the recommended minimum are in no wise prohibited and they are proper in cases where the building problem is of greater complexity than the average of its kind, resulting in an increase of the architect's office costs, or where the reputation and ability of the architect command a higher professional fee.

4. Professional ethics prohibit an architect from knowingly competing with his fellow architect on the basis of professional charges.

5. The fees should not be reduced on account of project cost decrease by use of salvaged materials, penalties or liquidated damages.

6. When the same drawings and specifications are used for more than one project or for more than one structure in a single project, the basic fees may be reduced proportionately to the required services.

7. Until definite construction costs have been determined, payments of fees should be based on the architect's approximate estimate, adjustments later being made when actual costs are known.

8. The project costs include the total of all contract sums incurred exclusive of the site acquisition costs and the fee paid the architect or compensation for consultants or clerks-of-the-work.

II. PAYMENT OF FEES

While the architect is performing his services he should be paid installments on his fees at monthly or other regular intervals as his services progress. At the end of each stage of services such installments should total the following fractions of his total fee:

1. At the completion of services of PRELIMINARY STAGE, a sum not less than 25% of his estimated total fee.

2. At the completion of services of WORKING DRAWING STAGE, a sum when added to (1) above, shall equal not less than 75% of his estimated total fee.

3. Progress payments shall be made during CONSTRUCTION STAGE on a basis as stipulated in Agreement with a final payment of the balance of the fee at completion of CONSTRUCTION STAGE.

III. PAYMENTS FOR PARTIAL SERVICES

1. If a project is abandoned or if the architect's contract is terminated at the completion of any stage of services, he should be paid for the completed portions of services.

SECTION C ....THE ARCHITECT'S AGREEMENT

No services should be rendered by the architect without a definite understanding as to the scope of services and the fee basis. This is for the protection of both the client and the architect, and it might often prevent misunderstandings, delays, or even law-suits. A client will usually appreciate a business-like procedure on the part of the architect. It is recommended that the current form of the Institute be used as a basis for the Argreement.

On minor projects, a letter addressed to the client may suffice, in which is stated in brief the outline of the project, the services to be rendered, and the fees to be paid. To be valid, such a letter should be accepted or acknowledged by the client.

806 *Tasks Performed in School Building Programs:*

806.01 Tasks listed are those generally performed during the development of satisfactory school building programs. The sequence of tasks is not always the same, nor is the time allotment always the same.

806.02 Care should be exercised by the owner (board of education) when undertaking any project to assure that all activities are in accordance with statutory and regulatory provisions and that the investment is adequately protected at all times.

806.03 Particular caution by the owner is required in Phase V if the owner is acting as its contractor or if maintenance employees are constructing the building or addition.

TASKS

Approximate time allotted	Task	Responsibility*
Phase I 24 to 72 weeks	Anticipates school building needs	0
	Seeks aid of education specialist	0
	Completes survey determining actual remodeling and construction needs	0
	Acts to secure levy or bond monies	0
	Seeks legal counsel on procedures to secure monies	0
	Initiates preparation of educational specifications	0
Phase II	Seeks architectural service	0
	Preliminary and final screening of architects	0
	Selects architect	0
	Owner/architect negotiate contract	0-A
	Establishes building program	0-A
8 to 16 weeks	Sets production time limits	0-A
	Selects and acquires sites (Health Dept. approval of water and sewage disposal systems, if rural)	0-A
	Surveys site, subsoil tests, etc.	0
	Analyzes educational specifications and other program aspects	A
	Prepares schematic designs	A
	Approves scheatic designs	0
	Prepares preliminary plans	A
	Prepares preliminary specifications	A
	Prepares preliminary estimates	A
	Confers on preliminaries	0-A
	Reviews plans in light of edspecs	0
	Revises preliminaries	A

Approximate time allotted	Task	Responsibility*
	Secures approval of State agencies	0-A
	Approves preliminary documents	0
	Authorizes preparation of final plans and specifications	0
Phase III 16 to 30 weeks	Approves special consultant, if any	0
	Selects furniture and equipment	0-A
	Prepares final working drawings	A
	Prepares final specifications	A
	Prepares final estimates	A
	Reviews plans in light of edspecs	0
	Confers on specifics	0-A
	Sets construction time limits	0-A
	Secures approval of State Education, Fire and Health agencies	0-A
	Revises, if necessary	A
	Confers and accepts	0-A
	Approves final documents	0
Phase IV 4 to 6 weeks	Selects contractors for bidding	A-0
	Advertises for bids	0
	Issues bid documents	A
	Receives bids	0
	Tabulates and reviews bids	0-A
	Advises on contract award	A
	Seeks approval of contract documents by legal advisor	0
	Awards contract	0
Phase V	Assists in execution of contract	A
	Executes contract	0
	Assures waiver of liens	0
	Issues procedure letter to contractor	A
	Field construction begins	0-A
	Supervises construction	A
	Prepares field inspection reports	A
	Reviews and approves shop drawings	A

Approximate time allotted	Task	Responsibility*
40 to 72 weeks	Inspects and approves samples	A
	Prepares monthly pay certificates	A
	Pays construction costs monthly	0
	Reviews construction reports, emergencies and delays	0-A
	Prepares and signs change orders	A
	Approves and countersigns change orders	0
	Receives special guarantees from contractors	A
	Makes final inspection	0-A
	Secures adjustments and corrections, if necessary	0-A
	Receives release of liens	0
	Makes final payment	0
	Instructs staff in use and operation of building	0-A
	Accepts building	0
	Assumes maintenance	0
	Dedication	0-A
	Makes final inspection prior to guarantees	0-A

* 0 —Owner (Board of education)
A—Architect

807 *Final Inspection:*

807.01 The final inspection of completed construction should be conducted by the architect, contractor, and representatives of the board of education. Each member of the group should be familiar with the plans and specifications. It is advisable that certain members be responsible for looking for specific items as well as inspecting the building generally. Irregularities and means of correction should be agreed upon by the group and listed for further checking.

807.02 Upon completion of corrections and subsequent inspection, official final acceptance of the project should be made subject to correction of any remaining irregularities and maintenance and guarantee agreements in the contract.

807.03 For the sake of illustration, the following list contains items which should be examined during the final inspection to assure compliance with final plans and specifications. Examine for proper type, location, installation, finish, cleanliness, mounting heights, operation, etc.

- Site and development:
  - Finish grading
  - Seeding
  - Landscaping
  - Walks
  - Drives
  - Parking areas
  - Fencing

- Building exterior:
  - Foundation
  - Wall surfaces
  - Window and door frames
  - Glass and glazing
  - Railings
  - Roof surface
  - Flashing
  - Trim
  - Drains

- Building interior (examine each space)
  - Floor surfaces
  - Wall surfaces
  - Ceiling surfaces
  - Acoustical materials
  - Doors and frames
  - Door hardware
  - Thresholds
  - Windows and frames
  - Glass and glazing
  - Window hardware
  - Chalkboards
  - Tackboards
  - Wood and metal trim
  - All surface finishes

- Plumbing-water, gas:
  - Fixtures
  - Shutoffs
  - Cleanouts
  - Drainage system

- Electric service:
  - Switches and plates
  - Panels
  - Lighting fixtures
  - Fire alarm system
  - Clock and program systems
  - Telephone system
  - Heating and ventilating equipment
  - Controls
  - Runs

- Equipment and furnishings:
  - Lockers
  - Extinguishers